Cyber Security Defense

Know thyself, know thy enemy, fear not 100 battles

Joseph Muniz

Security Architect – Americas Sales Organization

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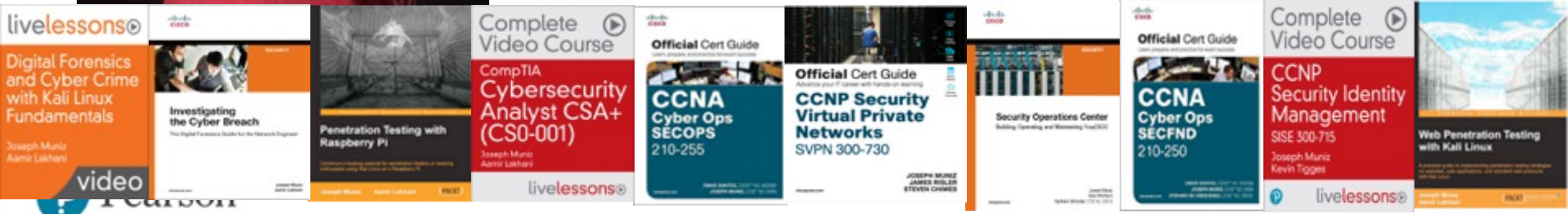
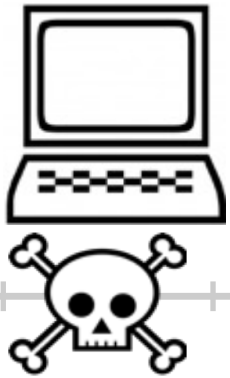
Speaker: Cisco Live / DEFCON / RSA / (ISC)2

Avid Futbal Player and Musician

Twitter @SecureBlogger



Cat And Mouse Game



Time

Computer OS

Internet Browser

Browser Plugins

Powershell
IoT
Phishing
Etc.

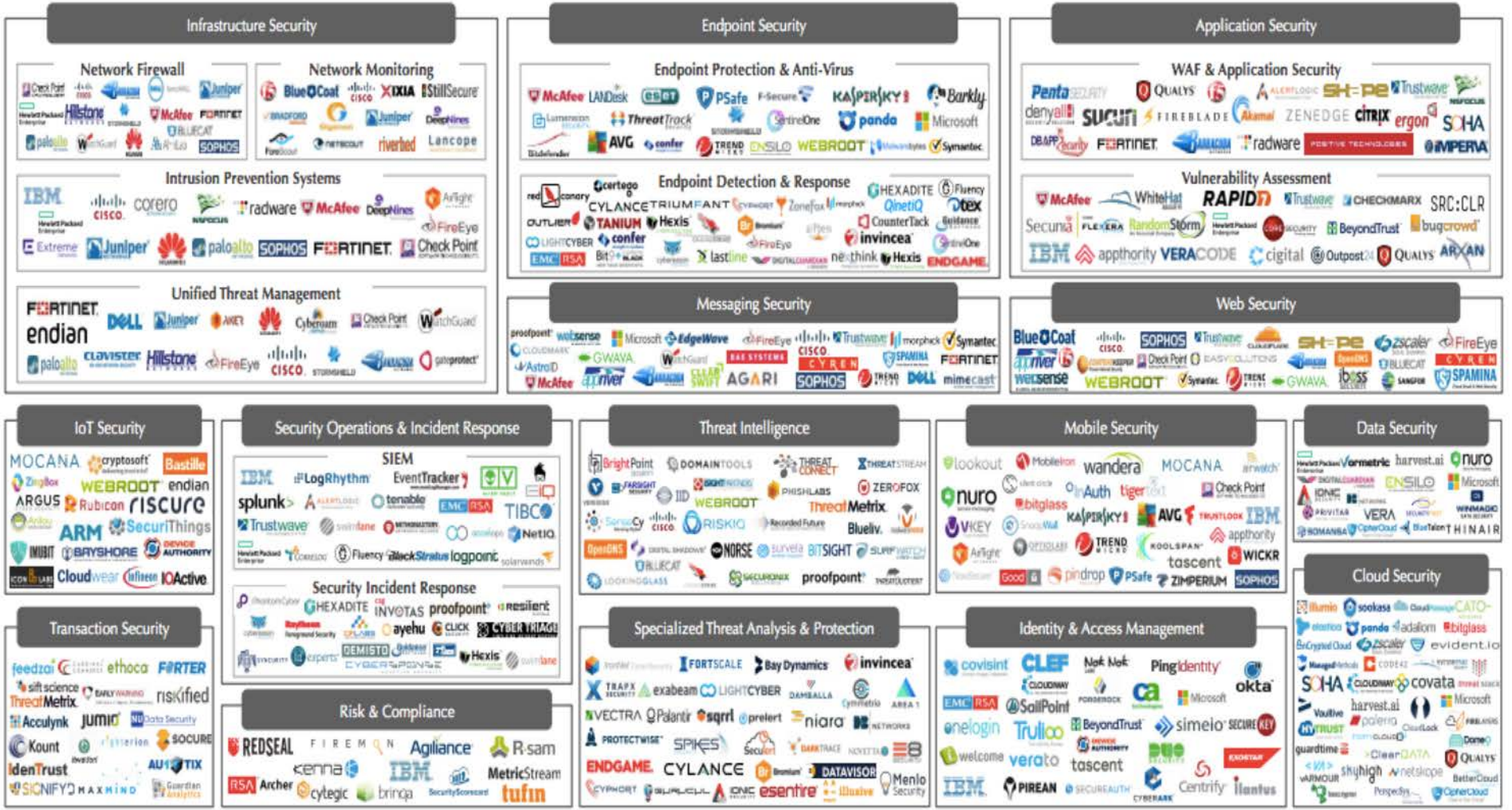
Adversaries Buy Products Too

Can’t Answer: What Happened?????

Can’t Answer: What Happened?????

Vulnerabilities

Malicious Sources



Source: Momentum Partners.

But wait … there's more

Growth of Internet Connected Devices Continues …

500
In 20

IoT Challenges

- Micro drive or plug to access hardware
- Firmware security analysis and modification
- Radio- / wireless-based exploitation
- Application exploitation
- Hardware exploitation (example JTAG)

NEWS

Half of US companies hit by IoT security breaches, says survey

By **Freddie Roberts** - June 5, 2017

> “Want to browse the internet? Pay the ransom. Want to use your baby monitor? Pay the ransom. Want to watch your smart TV? Pay the ransom.”

NEWS

Half … rity bread…

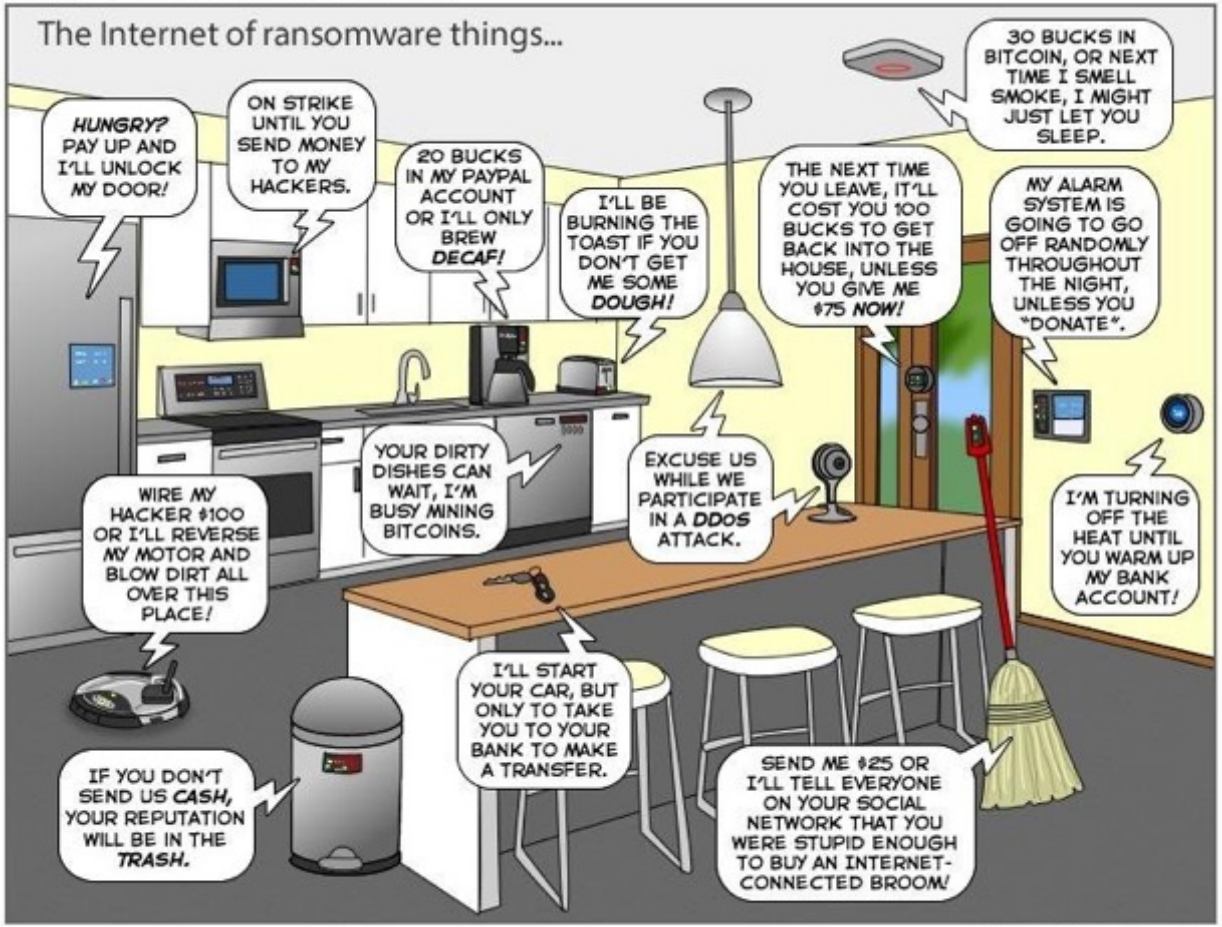
By Freddie Ro…

…ransom.

…ne

…? Pay

The Joy of Tech™ by Nitrozac & Snaggy



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Lack of Legal Enforcement

California just became the first state with an Internet of Things cybersecurity law

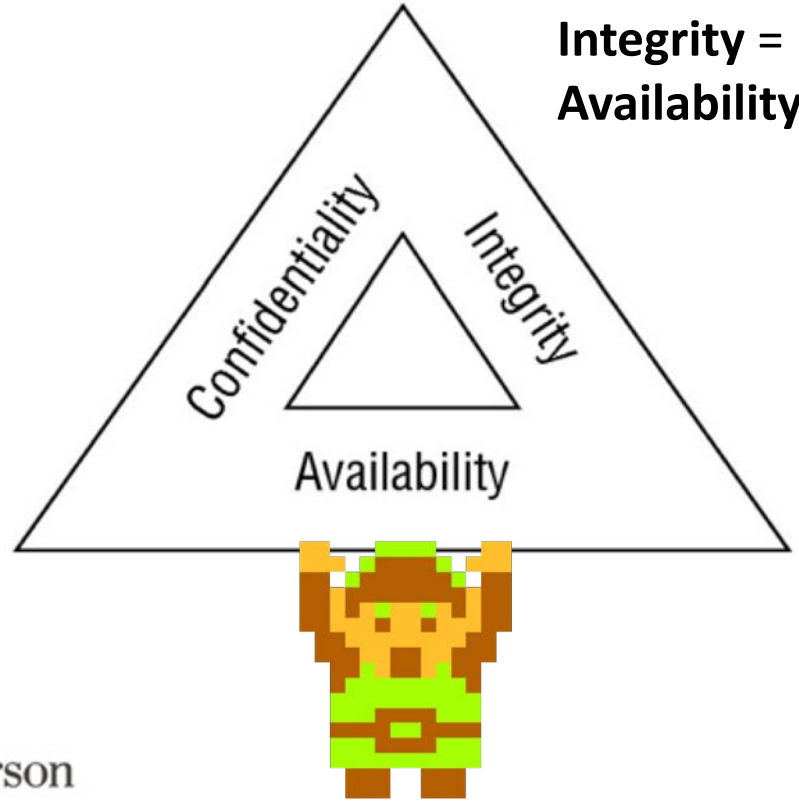
By Adi Robertson | @thedextriarchy | Sep 28, 2018, 6:07pm EDT

SHARE

Agenda

- Risk Management
- Security Operations (SOC)
- Cyber Defense
- Edge Defense
- Host Defense
- Access Control and Segmentation
- Breach Detection and Continuous Monitoring
- Architecture Best Practices
- Training and Certification

Cybersecurity Goals



Confidentiality = Protect sensitive data
Integrity = Ensure no unauthorized modifications
Availability = Authorized people can access it

Threats

Adversarial – Individual, groups or organizations (Hackers, Anonymous, etc.)

Accidental – Mistake that undermines security (configuration error)

Structural – Equipment, software or the environment fail (system crashes)

Environmental – Natural or man-made disaster (Godzilla / Hurricane)

Risk 10

fact

threat to a

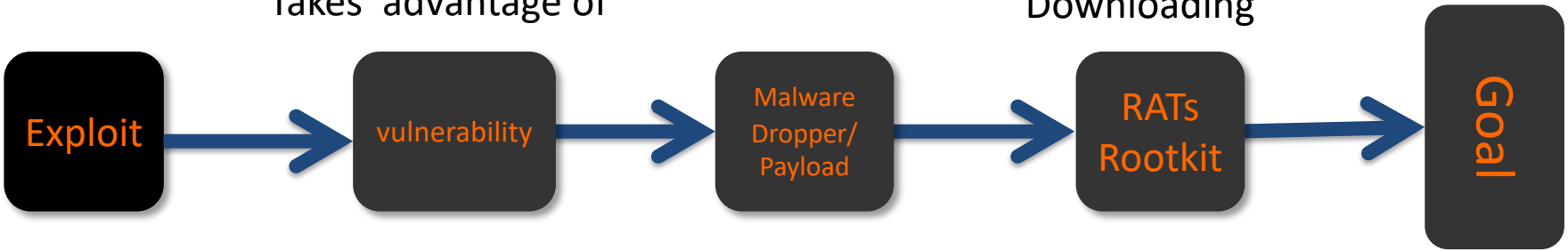
Threat x Vul

xpectancy x Asset

Singlelossexpectar

Takes advantage of

Downloading



To deliver

Objective

Vulnerabilities

- Weakness in system
- Configuration error, missing patch, flaw in design, etc.
- Signature security defend attacks (exploiting) against vulnerabilities. *Examples IPS, Anti-Virus*

Malware

Meltdown

Spectre

Common Vulnerabilities and Exposures (CVE)

Vulnerability Type: Apache vulnerability

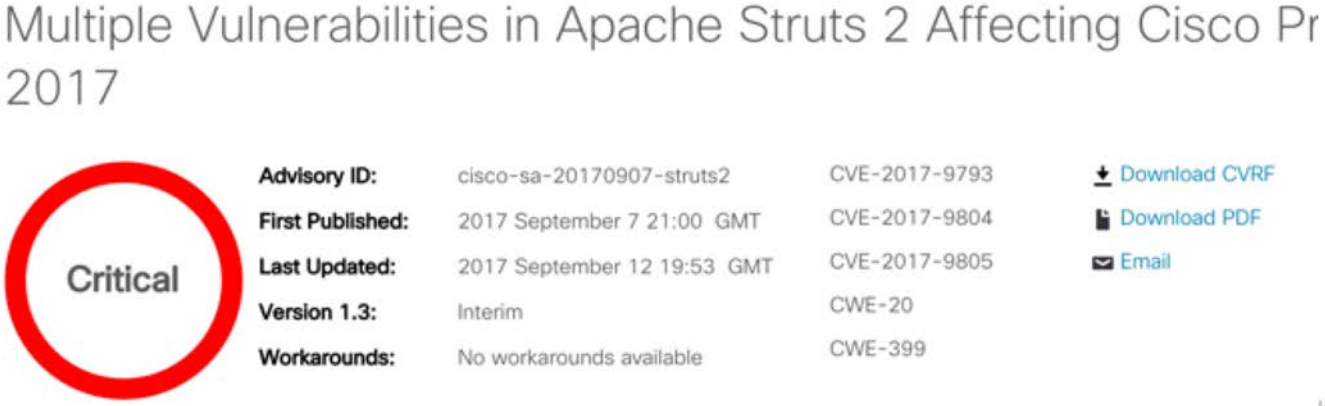
Threat Description: Three vulnerabilities in the Apache Struts 2 package

Existing Controls: Firewalled and monitored by IPS

Probability: Unlikely (not web facing)

Impact: Critical

http://cve.mitre.org/about/faqs.html



Joey’s Shoes 2.0

Joey's Shoes 2.0

Common Vulnerability Scoring System

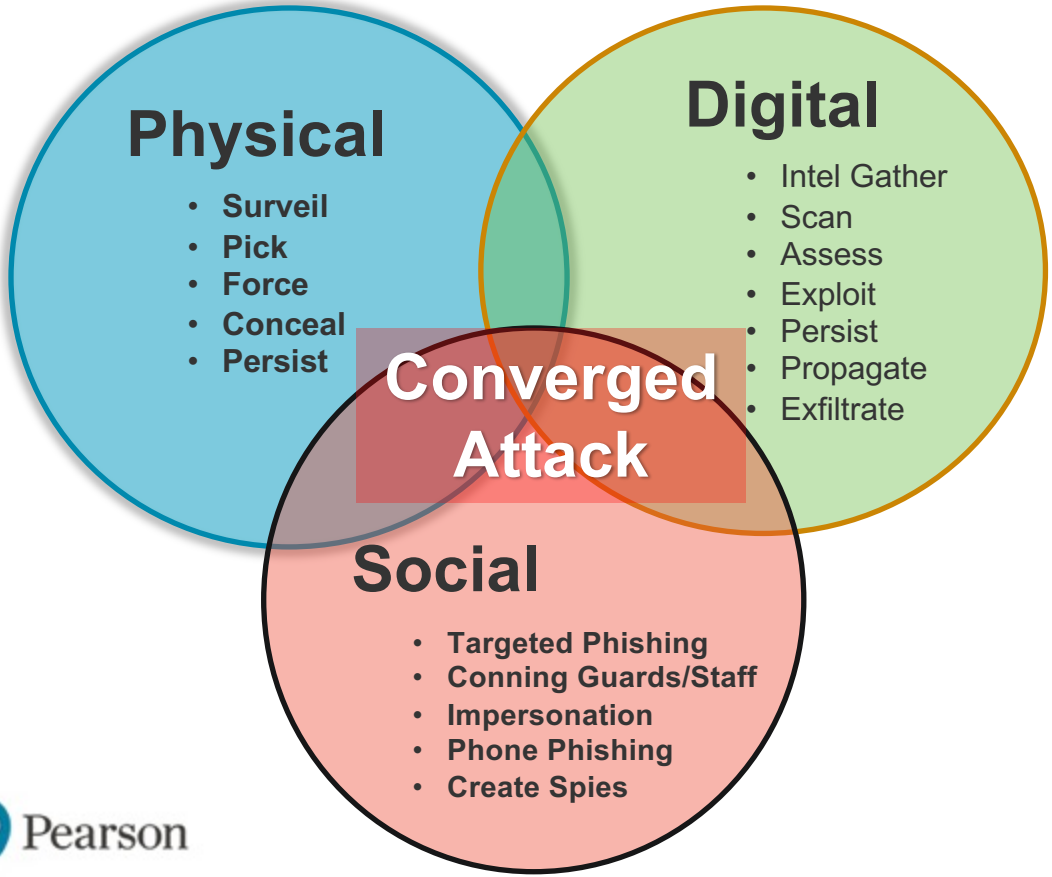
Consistent standard for computing vulnerability severity
Examples are version 2 and most used but version 3.1 is the latest

Access Vector	Local (L) = 0.395	Adjacent Network (AN) = 0.646	Network (N) = 1.0
Access Complexity	High (H) = .035	Medium (M) = 0.61	Low (L) = 0.71
Authentication	Multiple (M) = 0.45	Single (S) = 0.560	None (N) = 0.704
Confidentiality	None (N) = 0.00	Partial (P) = 0.275	Complete (C) = 0.66
Integrity	None (N) = 0.0	Partial (P) = 0.275	Complete (C) = 0.660
Availability	None (N) = 0.0	Partial (P) = 0.275	Complete (C) = 0.660

Patching

- Piece of software designed to update a computer program or data to fix or improve it.
- **This includes fixing security vulnerabilities!**
- Sometime could introduce new problems so backup planning should be performed before installing

Vectors of an Attack



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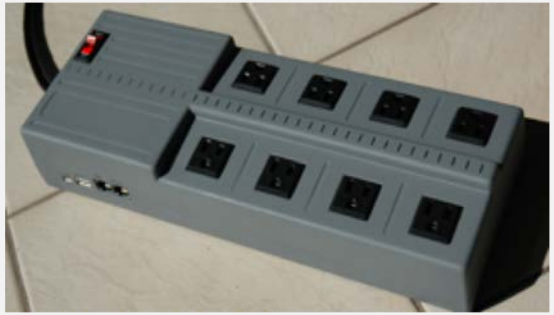
Physical Attacks

Keyboard Drivers

System Backdoor

Network Backdoor



Digital Attacks

NMAP shows Open Ports!

Nexpose shows vulnerabilities

Metasploit delivers attack

Firefox

BeEF Control Panel

192.168.1.1:3000/ui/panel

NOTIFICATIONS

[redacted] **endorsed you** for a skill: Cisco Technologies

1h

[redacted] **endorsed you** for a skill: CCNA

1h

- Detect CUPS
- Get Clipboard
- Make Telephone Call
- IPEC (6)
- Metasploit (0)
- Misc (4)

Example Exploit Kits And Ransomware

User Goes To Website

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Example Exploit Kits And Ransomware

Compromised Advertisement Sends To Gate

User Goes To Website

Pearson

Example Exploit Kits And Ransomware

Compromised Advertisement Sends To Gate

Vetted Users Sent To Landing Page (could be angler)

User Goes To Website

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Example Exploit Kits And Ransomware

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Exploit (maybe Java)

Exploit (maybe Flash)

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Example Exploit Kits And Ransomware

Compromised Advertisement Sends To Gate

Vetted Users Sent To Landing Page (could be angler)

User Goes To Website

Exploit (maybe Java)

Exploit (maybe Flash)

Payload Delivered (probably Ransomware)

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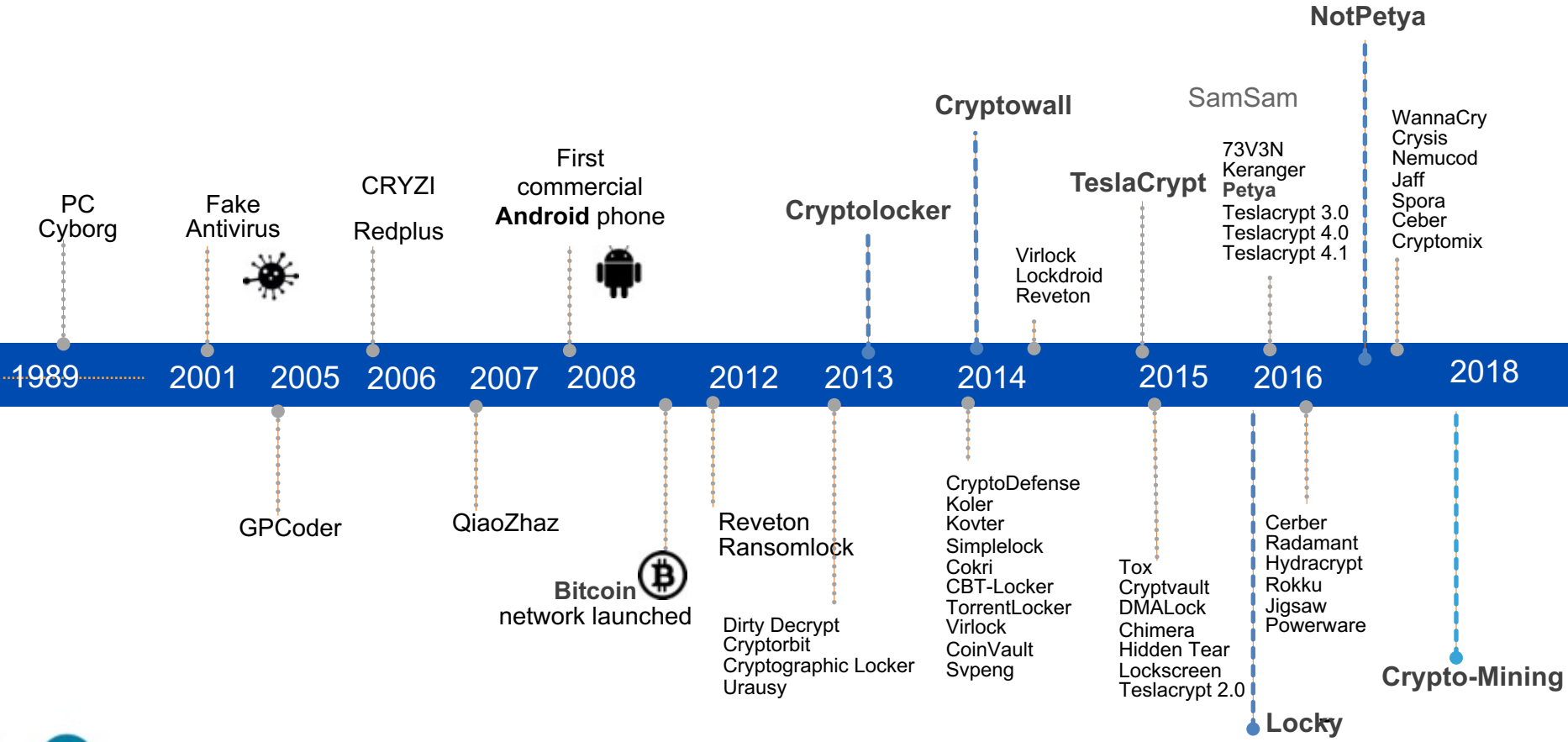
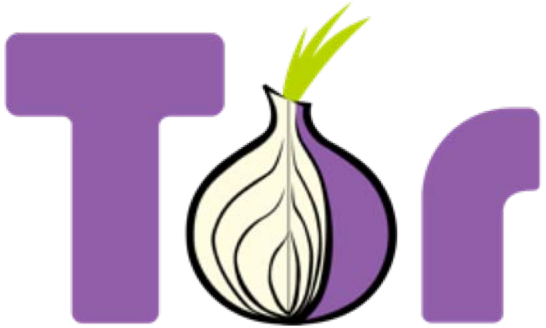
The Evolution of Ransomware Variants



Ransomware Evolution



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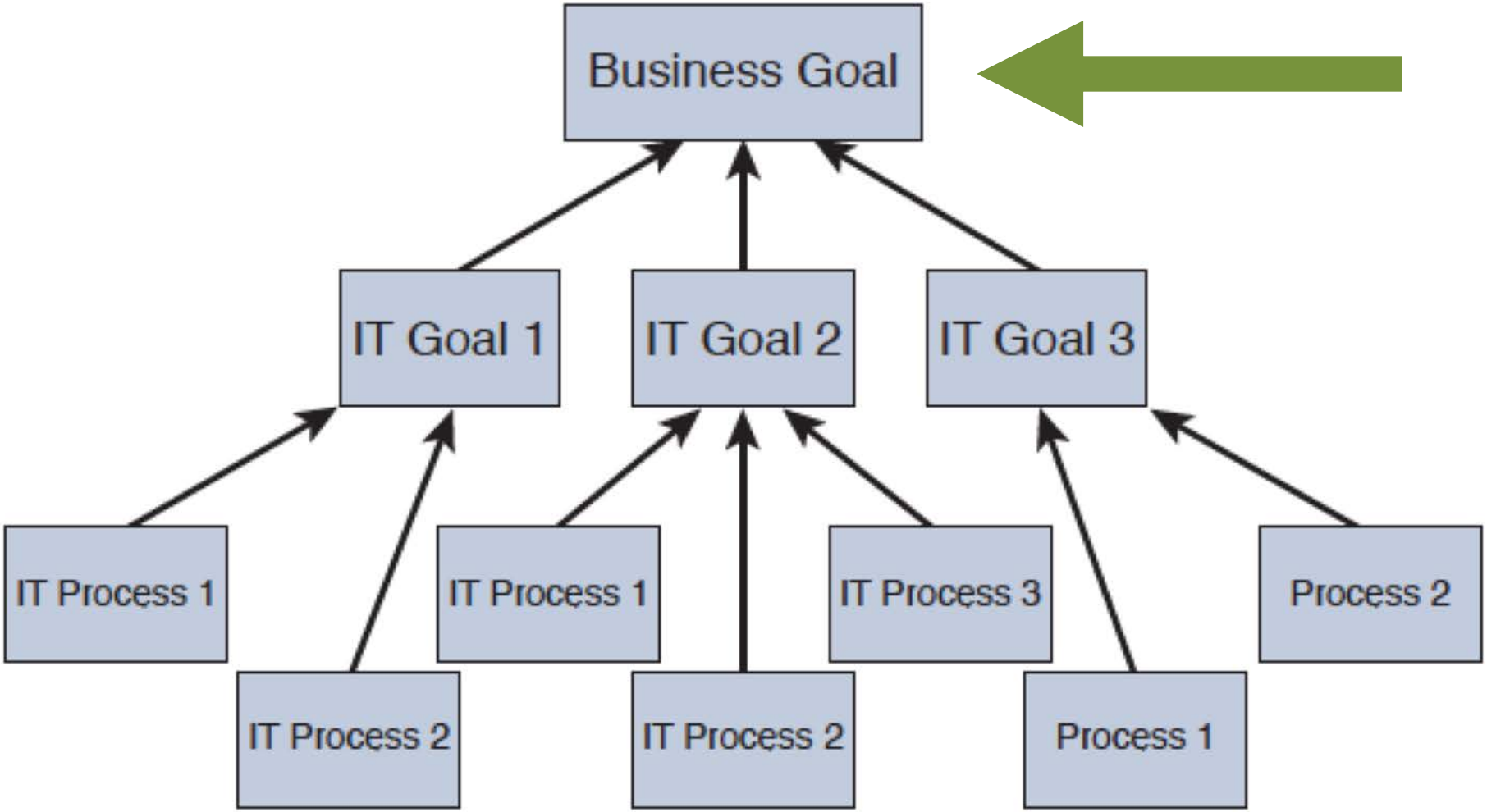
Social Engineering + Phishing Themes

COVID-19: Hackers Begin Exploiting Zoom's Overnight Success to Spread Malware

March 30, 2020 Ravie Lakshmanan

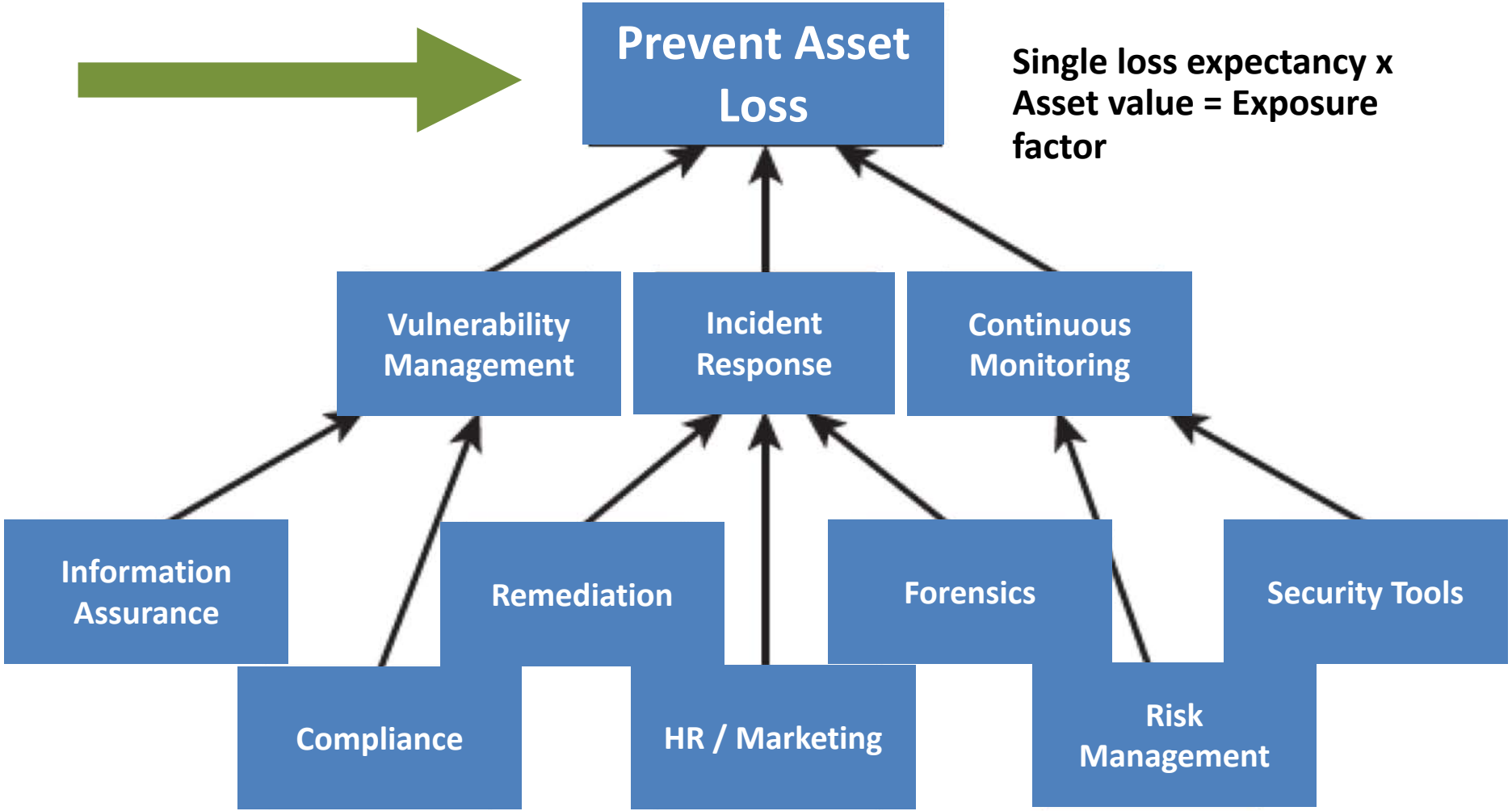
Security Operations 101


Business Goal
IT Goal 1
IT Goal 2
IT Goal 3
IT Process 1
IT Process 2
IT Process 1
IT Process 2
IT Process 3
Process 1
Process 2

Need Executive Sponsorship for Success

- Who influences funding?
- What is considered success?
- How is grading achieved?

Business focus is critical!


Prevent Asset Loss
Single loss expectancy x Asset value = Exposure factor
Vulnerability Management
Incident Response
Continuous Monitoring
Information Assurance
Compliance
Remediation
HR / Marketing
Forensics
Risk Management
Security Tools

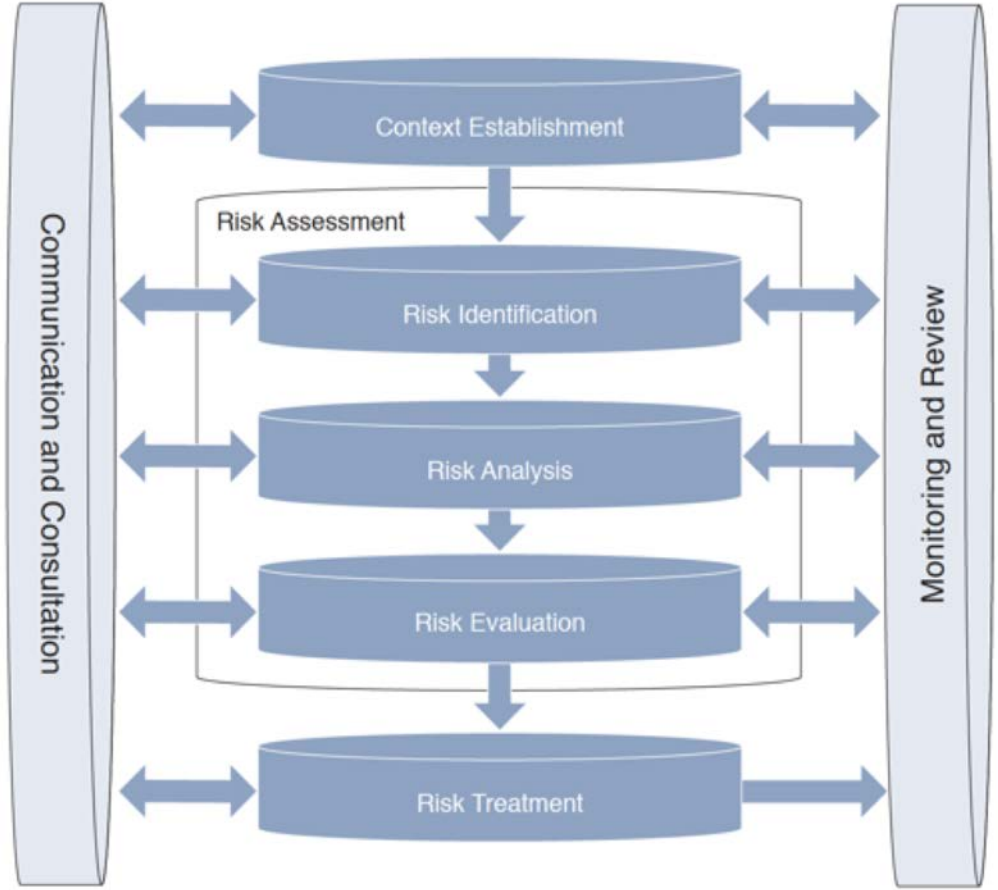
ISACA COBIT Maturity Levels

Grade	
0 – No Program	No Capabilities or Processes
1 – Ad Hoc	Recognized problems. Ad hoc Approach
2 – Repeatable but intuitive	Some process but no formal training or procedures. Self ran
3 - Defined Process	Documented process but up to individual to follow
4. – Managed and Measurable	Monitor and manage compliance. Action can be taken to improve

SOC Capabilities

- **Risk Management** – Dealing with all Risk
- **Vulnerability Management** – Dealing with specific vulnerabilities
- **Compliance** – Meeting requirements
- **Analysis** – Analyze various types of artifacts
- **Incident Management** – Responding to cyber attacks
- **Digital Forensics** – Understanding what happened
- **Situational and Security Awareness** – Threat awareness
- **Research and Development** – Response to changing landscape

Service 1: Risk Management



Formal programs include

- ISO/IEC 27005:2010
- ISO/IEC 31000:2009
- NIST SP 800-39
- OWASP Risk Rating Methodology
- DoD Risk Management Framework (RMF).

Risk Actions

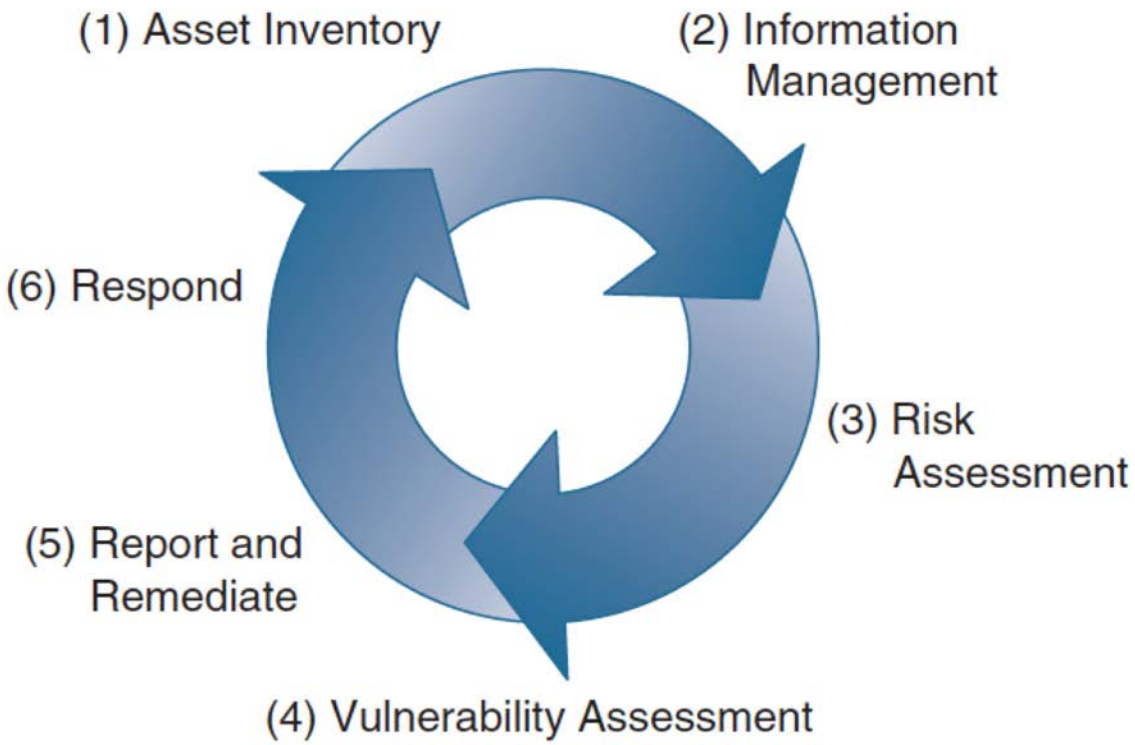
- **Risk Reduction** – Implement Countermeasure
- **Risk Transfer** – Purchase Insurance
- **Risk Acceptance** – Accept a Possible Loss
- **Risk Rejection** – Pretend There Isn't a Risk

How to prioritize risk

Threat Agent Factors				Vulnerability Factors			
Skill Level	Motive	Opportunity	Size	Ease of Discovery	Ease of Exploit	Awareness	Intrusion Detection
1	7	5	2	6	3	2	9
Likelihood of Threat = 4.375 MEDIUM							

Technical Impact				Business Impact			
Loss of Confidentiality	Loss of Integrity	Loss of Availability	Loss of Accountability	Financial Damage	Reputation Damage	Non-Compliance	Privacy Violation
8	9	7	5	2	2	1	5
Technical Impact = 7.25 EXTREME				Business Impact = 2.25 LOW			

Service 2: Vulnerability Management



- SANs Example
- NAC and Profiling can help with Asset Inventory
- Triggers
  - CVE Identifier may trigger event
  - Assessment tools
  - Audits

Service 3: Compliance

- Legal or Business
- Should be minimal security
- SOC enforces and reports
- Customized dashboards can help!

- **AIM for going beyond compliance**

Assessment vs. Penetration Test

- **Assessment** – Using automated systems to identify **potential** vulnerabilities
- **Penetration Test** – Executing attacks against identified vulnerabilities

Assessment is good to see your weaknesses

Penetration Testing is good if you know you are secure

Credential Scan

- **Host Scan**
- Less load on network (enumerated from local machine via commands like netstat)
- Considered “Safer Scan”
- Only need Read-only access
- Better data (more accurate)
  - Registry scan data and file attribute information
  - Behind personal firewall

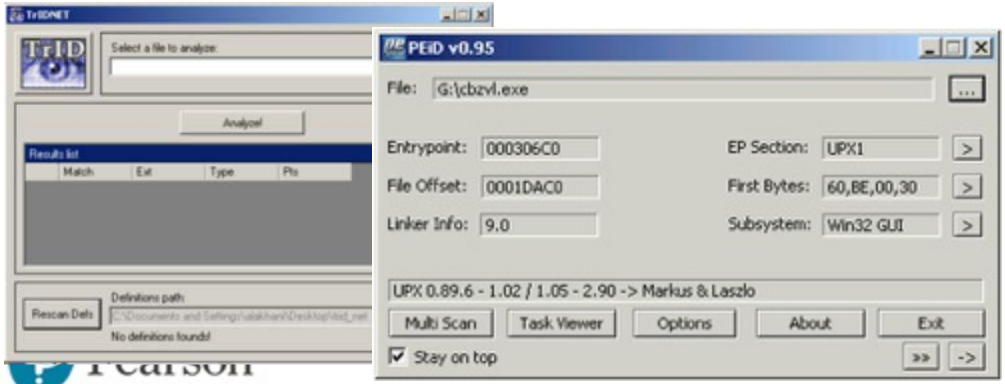
Non-Credential Scan

- Network scan
- Similar to attacker viewpoint (external view)
- Relies on ports to return correct information about services running
- Potential false positives

Key Concept: Potentially more important vulnerabilities as these are what attackers would find first.

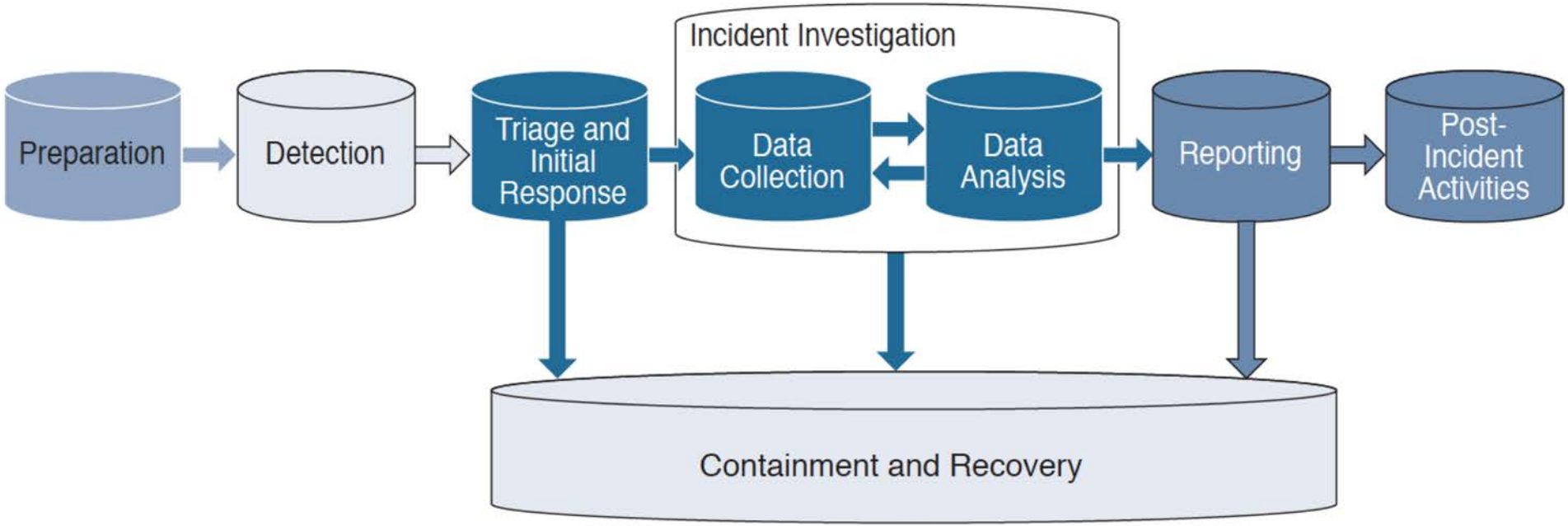
Service 4: Analysis

- Analyzing various artifacts (TrIDNET / PEiD)
- Reverse Engineering
- Run time and dynamic analysis
- Vulnerability Analysis



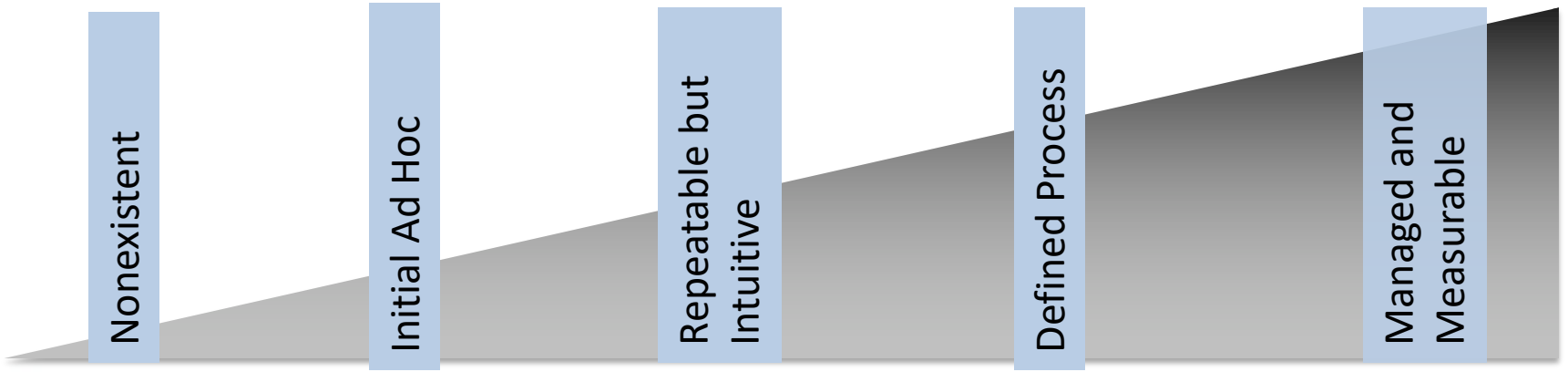
Service 5: Incident Management

Detecting and responding to security incidents or



Security Incident

High	Incidents have server impact
Medium	Incident has significant impact
Low	Incident has minimal impact



Maturity Level For Incident Response

References for Incident Response

FIRST CSIRT Framework

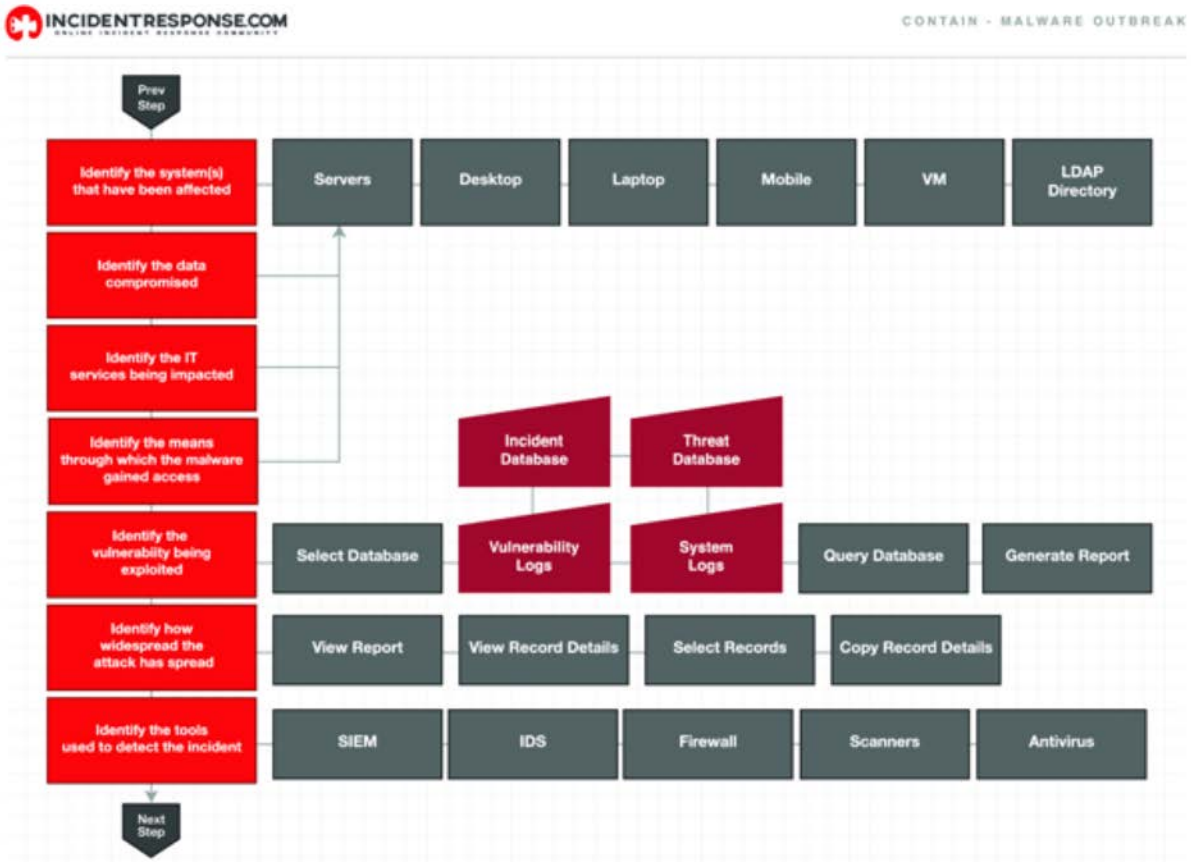
https://www.first.org/education/csirt_service-framework_v1.1

PSIRT Services Framework

https://www.first.org/education/FIRST_PSIRT_Service_Framework_v1.0

Playbooks

https://www.incidentresponse.com/playbooks/



SIEM

Security Information and Event Management – Centralized log collection from various tools to mine data and respond to events

SOAR

Security Orchestration, Automation and Response – Collects data from a range of sources and automates response when possible

XDR

Endpoint Detection and Response (EDR)– Uses local detection and cloud capabilities to detect threats on endpoints

(XDR) – X represents multiple data sources to expand EDR. XDR is the future of EDR allowing for network, endpoint and cloud data.

Service 6: Digital Forensics

- Understand what happened
- Collect evidence for potential legal action
- Support HR for evidence of internal complications

Service 7: Situation and Security Awareness

- Training and education
- Understanding industry trending threats
- Policy advertisement
- Mentoring

Service 8: Research and Development

- Work with stakeholders to educate about risks
- Understanding industry trending threats

Managed Services vs Internal Pros

Internal

- Knowledge of business
- Data stored internally
- Cross department correlation
- Tailored requirements

External

- OPEX costs that can be spread out
- No conflict of interest
- Scalability and flexibility
- Leverage other customer trends

Managed Services vs Internal Cons

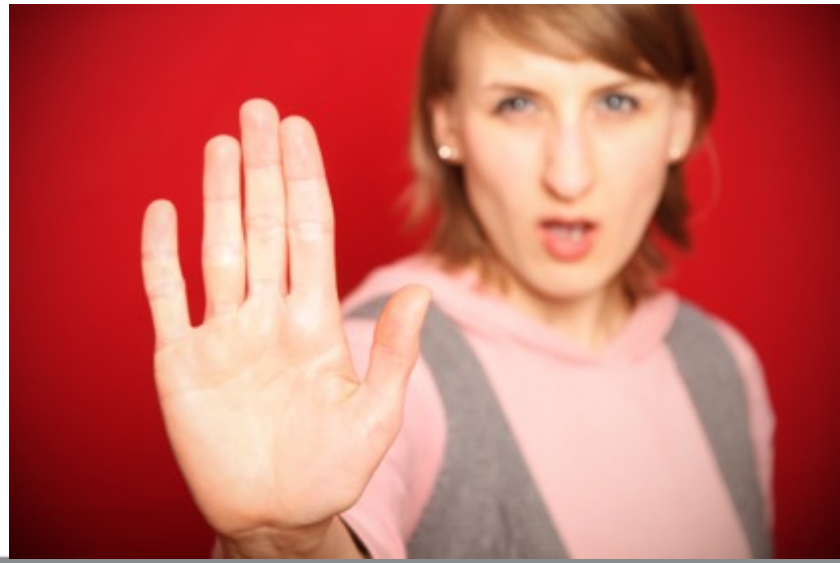
Internal

- Cost
- People (Hire / Maintain)
- Potential conflict of interest
- ROI concerns

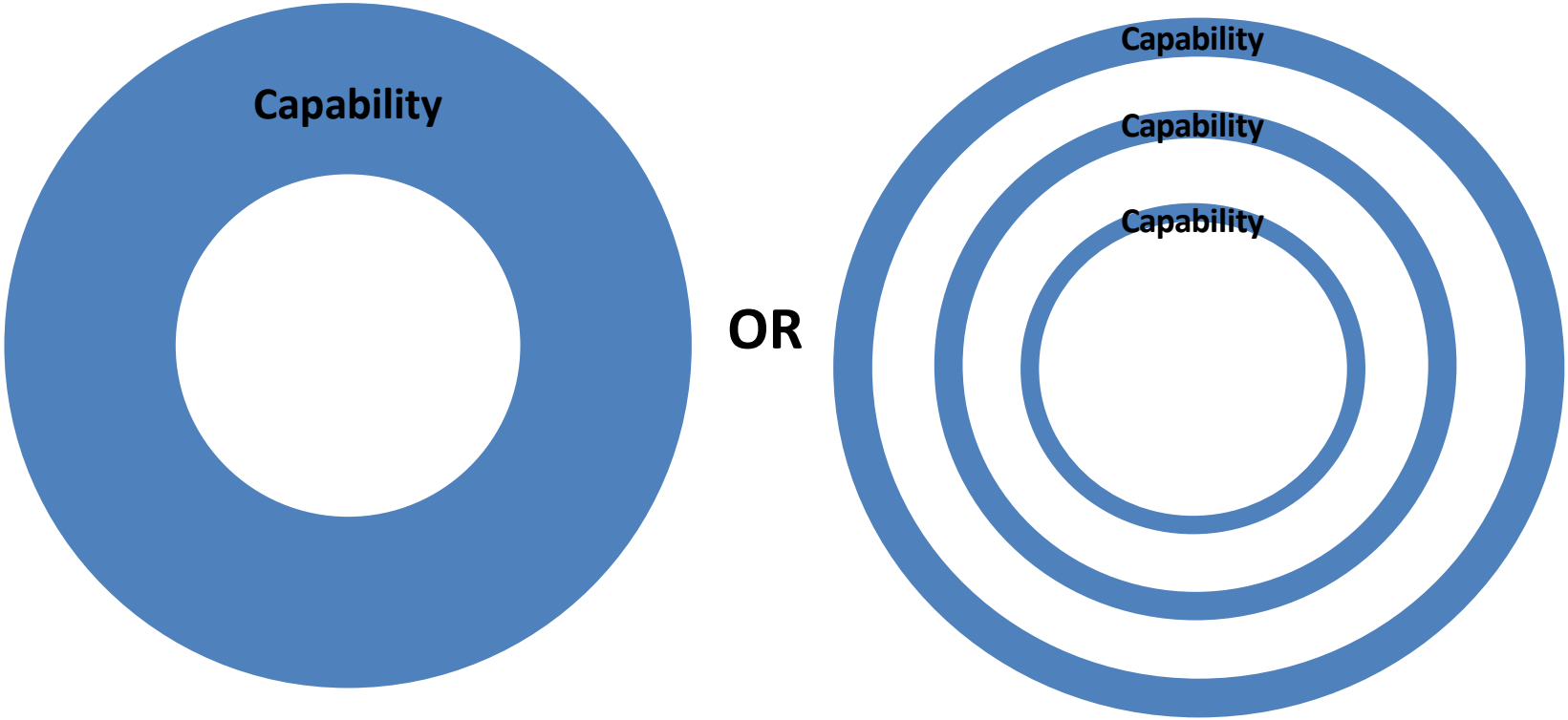
External

- Limited business knowledge
- External tools and data flow
- Lack of communication
- Usually not detected people
- Limited customization
- Services are limited based on cost (Gold, Silver, Bronze)

Cyber Defense 101



Best of Breed vs Defense in Depth



Defense in Depth

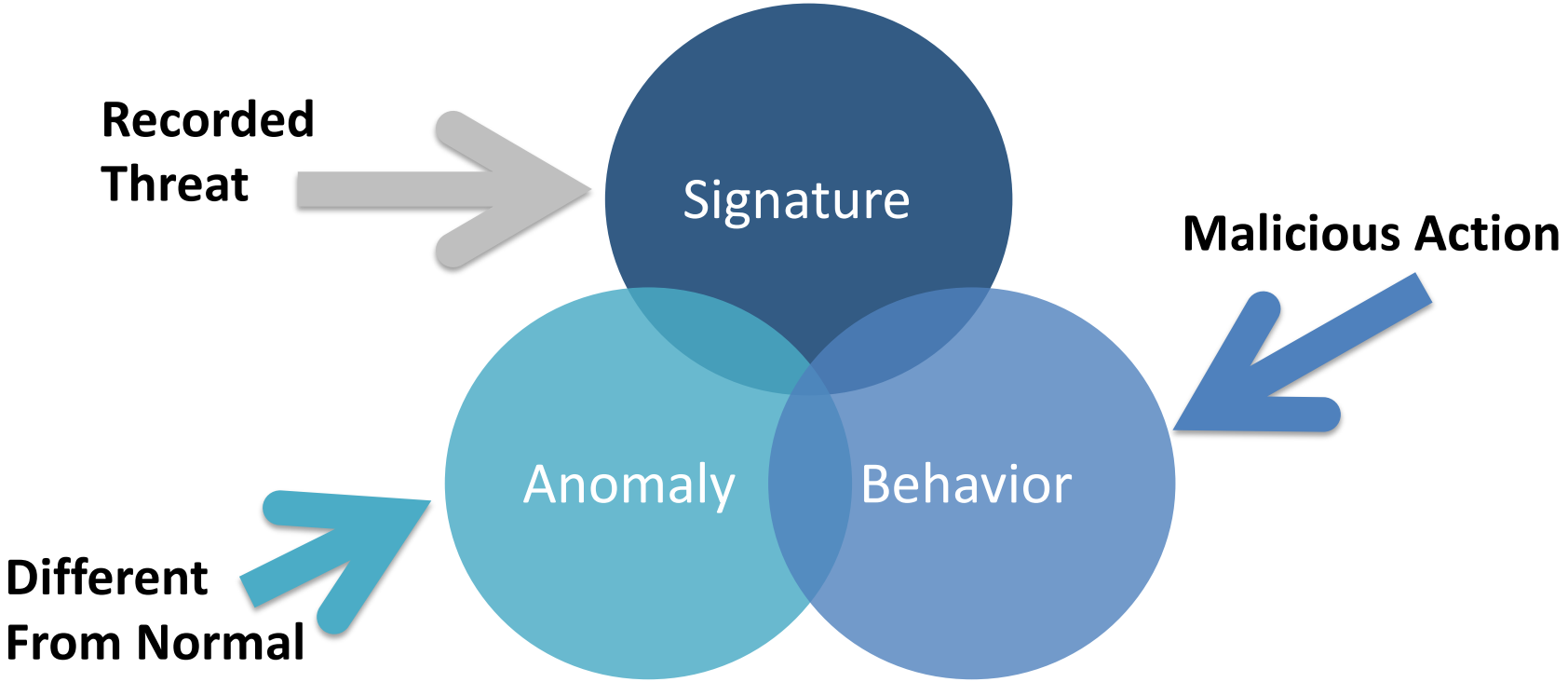
- Layering defenses
- Best practice use different capabilities according to kill chain
- Should apply to all areas of network

Defense in Depth

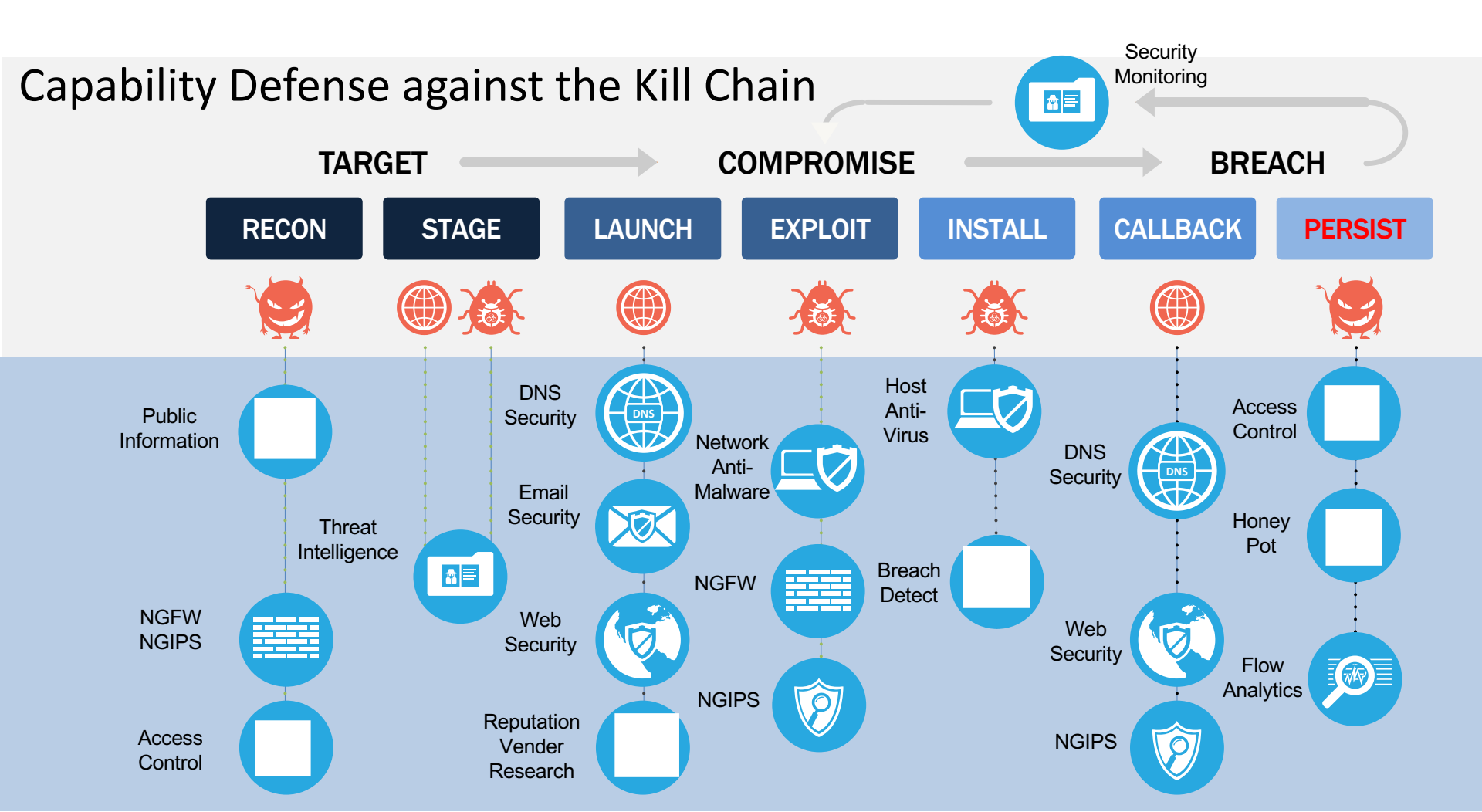
- Leverage different security levels when using the same technology

Perimeter Firewall	**Trust 0 outside | 50 DMZ | 100 inside**
Internal Firewall	**Segment employees, HR, Guests, etc.**
Data center Firewall	**Segment data center resources / applications**

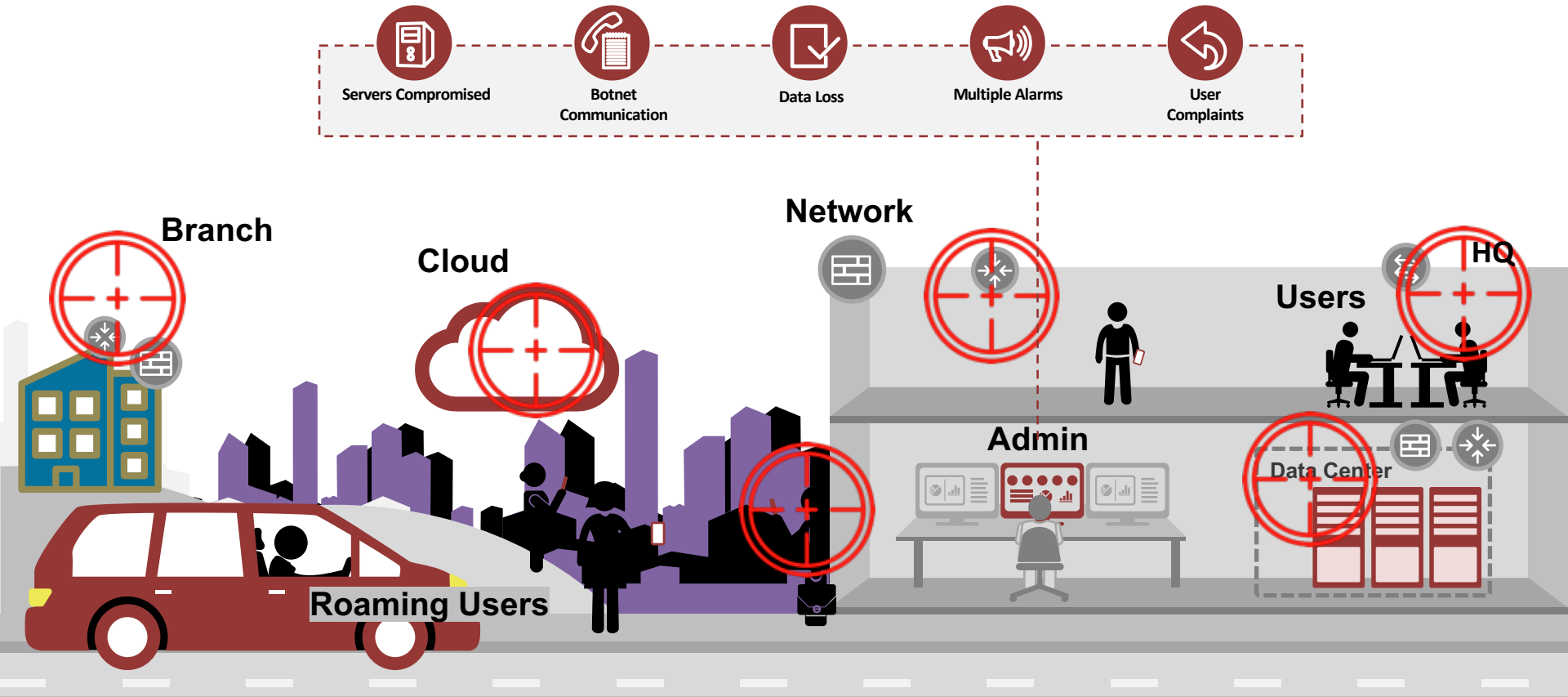
Security Capabilities



Capability Defense against the Kill Chain



Many Targets to Consider



Known and Unknown Threats

- **Known** – Attack has been seen and characterized
  - Develop signatures for detection
  - Behavior triggers
  - Domains blocked
    - Antivirus / IPS leverage this
- **Unknown** – Attack not known and characterized
  - Signatures do not exist
  - Behavior and anomaly detection focused
    - Breach detection / Sandboxing / Honeypots

Whitelisting and Blacklisting

- Blacklisting – Blocking specific software from being installed
- Whitelisting – Prevents software that is not on a preapproved list
- Signature based – One specific threat

Threat Intelligence

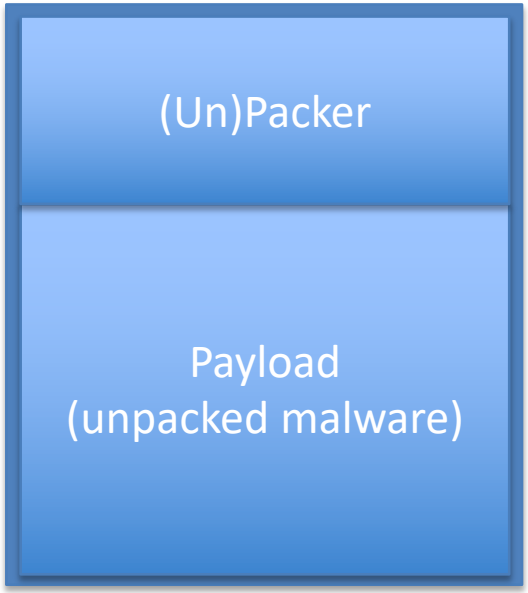
- Evidence-based knowledge, including context, mechanisms, indicators, implications and actionable advice about an existing or emerging threat

- Think what "Other Networks" are seeing

Example: Other company data warned us about evil.exe and now raised to a critical threat when seen on our network

Packing Malware 101

Bypass signature based detection



Frequently Changed

Changed Less frequently

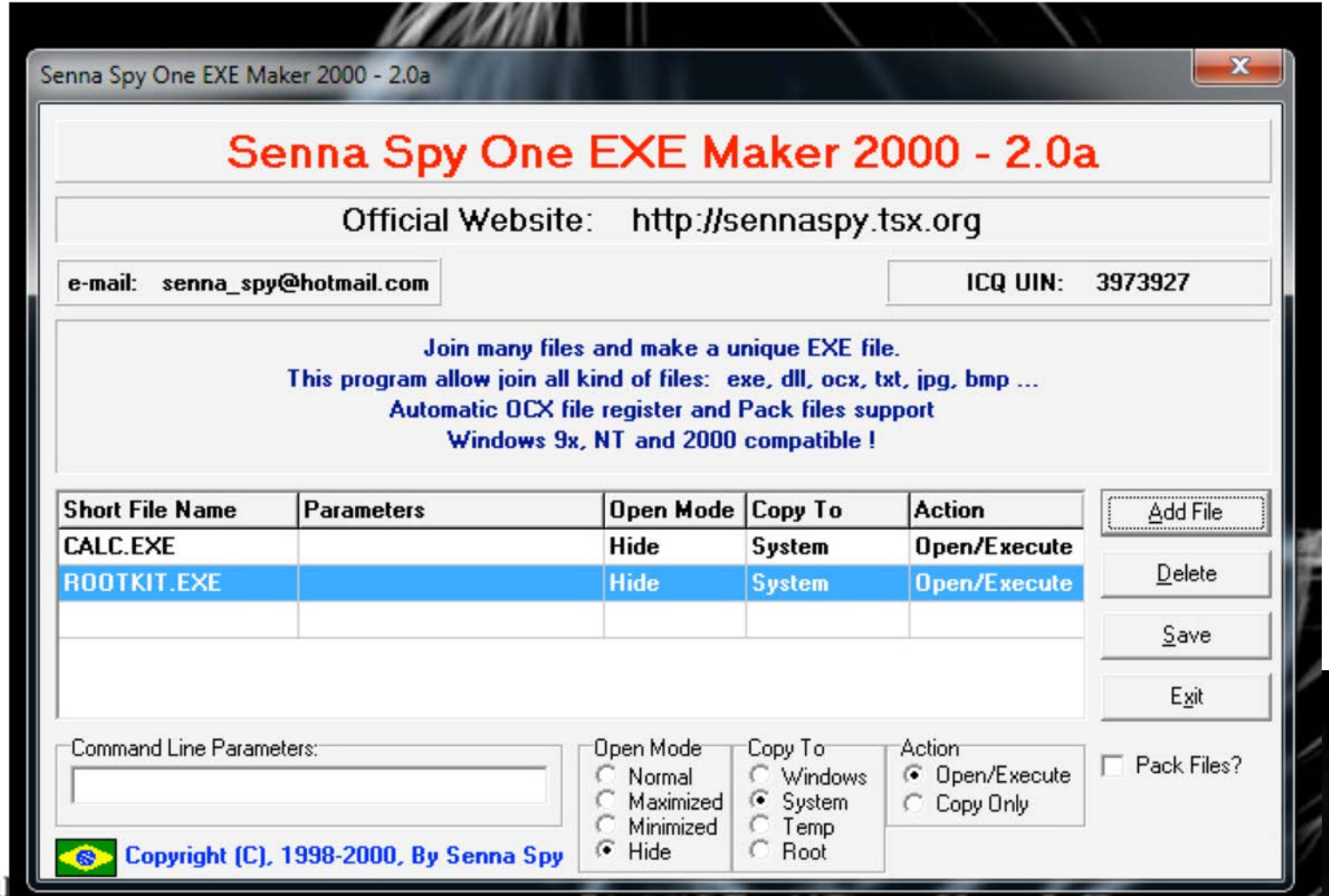
Executable

Maintaining Malware Is a Fulltime Job

Coder Team
3 group members
6AM-8PM GMT
Mo-Fr* (Su)

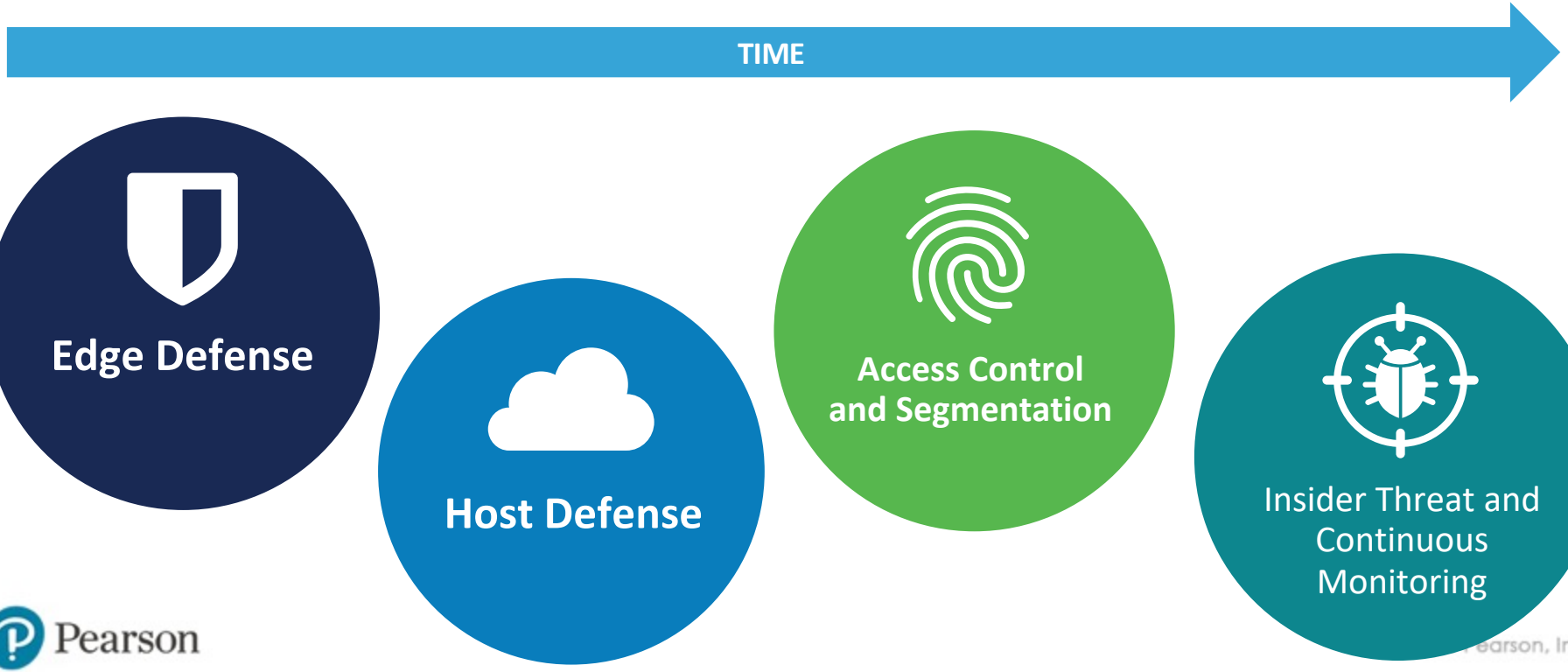
Packer Team
9 group members
~10AM - 10:30PM GMT
Mo-Sa* (Su)

Developing and maintaining malware and a malicious infrastructure is a full time job !


Senna Spy One EXE Maker 2000 - 2.0a
Senna Spy One EXE Maker 2000 - 2.0a
Official Website: http://sennaspy.tsx.org
e-mail: senna_spy@hotmail.com
ICQ UIN: 3973927
Join many files and make a unique EXE file.
This program allow join all kind of files: exe, dll, ocx, txt, jpg, bmp ...
Automatic OCX file register and Pack files support
Windows 9x, NT and 2000 compatible !
Short File Name
Parameters
Open Mode
Copy To
Action
CALC.EXE
Hide
System
Open/Execute
ROOTKIT.EXE
Hide
System
Open/Execute
Add File
Delete
Save
Exit
Command Line Parameters:
Open Mode
Normal
Maximized
Minimized
Hide
Copy To
Windows
System
Temp
Root
Action
Open/Execute
Copy Only
Pack Files?
Copyright (C), 1998-2000, By Senna Spy

Security Best Practices

- Scaled For Security Maturity -



Edge Defense

Edge Security Technologies

- **WAF** – Web application firewall for application / layer 7 attacks
- **Firewall / NG Firewall** – Permit and deny traffic. Also physical segmentation
- **IDS / IPS** – Detect and prevent attacks
- **DNS** – Prevents connections to malicious sources
- **Reputation / Threat Intelligence** – Threat data from other networks.
- **Proxy** – Mask system data

Firewall 101

- **Packet Filter** – Simply checks the characters of each packet against firewall rules
- **Stateful Inspection** – Beyond packet filters also viewing state of connection. (What today's standalone firewalls do)
- **Next Gen** – Beyond stateful including applications, users and context
- **Web Application Firewall** – Specialized for web application attacks such as SQL injection and cross site scripting

Proxy vs. Application Layer Firewall

Proxies

- Internet bound ports (80, 443)
- Cache traffic
- Higher performance (example HTTPS decryption)

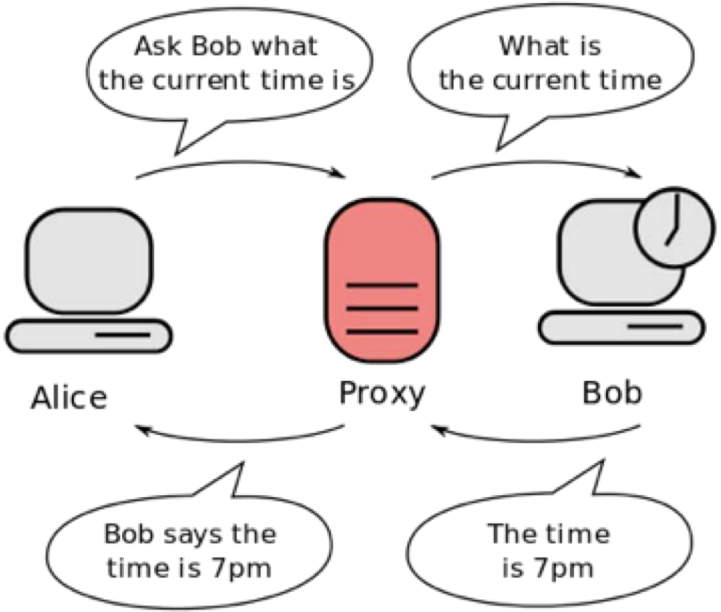
Application Layer Firewalls

- All ports and protocols
- View near real time traffic / no cache
- Typically part of “Next Gen” platforms

- Both typically offer security detection and content filtering capabilities
- Security value depends on model and installation

Intercepting Messages - Proxy

- Display and modify HTTP and WebSockets messages that pass between the proxy clients and web server.



Types of Proxies

- **Open Proxy** – Accessible by anybody on the Internet
  - Can conceal user IP
  - Typically done directly from host or using WCCP routing

- **Reverse Proxy** – Proxy appears to clients as ordinary server. Requests are forwarded to one or more servers, which handle requests

- **Man-in-the-middle** – Attacker captures traffic via ARP poisoning, going in-line, DNS spoofing, STP mangling, etc.

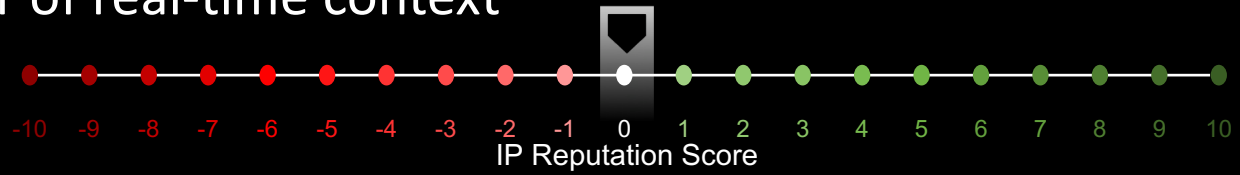
Web Application Firewall WAF

- All ports and protocols
- View near real time traffic / no cache
- Typically part of “Next Gen” platforms
- Sometimes called UTM (with other features)

Palo Alto – Cisco Firepower – Checkpoint - Fortinet

Reputation Analysis

The power of real-time context



17.0.2.12

Kiev

HTTPS

Web server
< 1 Month

Reputation Analysis

The power of real-time context

Who	Where	How	When
Suspicious Domain Owner	Server in High Risk Location	Dynamic IP Address	Domain Registered < 1 Min

TrustedBank™

Dear valued customer of TrustedBank,

We have recieved notice that you have recently attempted to withdraw the following amount from your checking account while in another country: $1

If this information is not correct, someone unknown may have access to y account. As a safety measure, please visit our website via the link below t your personal information:

http://www.trustedbank.com/general/custverifyinfo.asp

Once you have done this, our fraud department will work to resolve this discrepency. We are happy you have chosen us to do business with.

Thank you,
TrustedBank

Phishing

Click Jacking

TrustedBank™

Dear valued customer of Truste

We have recieved notice that yo
following amount from your che

If this information is not correct,
account. As a safety measure, p
your personal information:

http://www.trustedbank.com/ger

Once you have done this, our fr
discrepency. We are happy you

Thank you,
TrustedBank

Click Jacking

50 PM
one
)
com
and enter code 7923 will
keep a new

Phishing

Botnets / Worms

SECURITY THREAT DETECTED AND BLOCKED

Based on Cisco security threat information, access to the web site http://ihaveabadreputation.com/ has been blocked by the Web Security Appliance (WSA) to prevent an attack on your browser. The Cisco Security Intelligence Operations (CSIO) Web Reputation Score for this site indicates that it is associated with malware/spyware, and poses a security threat to your computer or the corporate network.

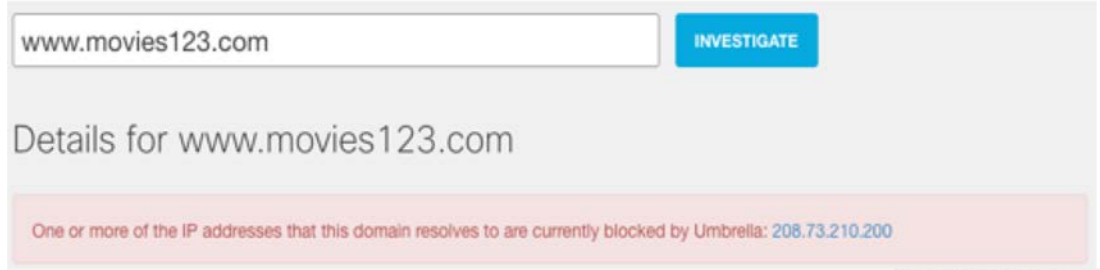
In order to cater for a growing number and variety of devices on the Cisco network, malware protection has shifted from the endpoint, deeper into the network. In order to offer the most effective protection to computing assets on the Cisco network, CSIRT and Cisco IT jointly rolled out the Cisco Ironport WSA solution on all Cisco Internet Points of Presence (IPoPs). These WSAs are configured to block access to sites whose Web Based Reputation Score (WBRS) shows that they are serving malware or content otherwise harmful to users of the Cisco corporate network.

If you believe this page was incorrectly blocked, please open a case with Infosec, providing the corresponding debug information below, and an analyst will determine whether the block was due to a misclassification. Please note that Cisco Infosec does not add sites to the WSA allowed-list on demand, and may require the end-user to contact Senderbase directly in order to submit a request to have a site removed from the WSA blocked-list.

Debug information to include when opening a case:

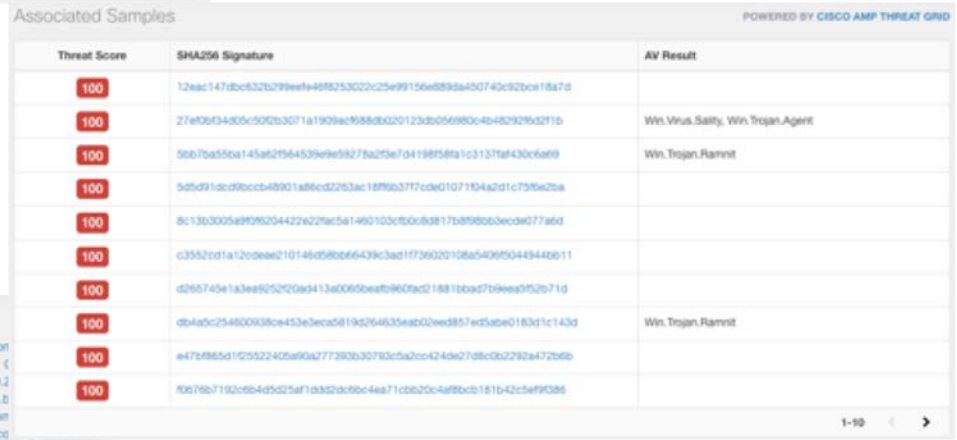
Date:	Thu, 09 Oct 2014 17:35:41 GMT
Time:	1412876141.450
Client IP address:	10.118.14.120
Request URL:	http://ihaveabadreputation.com/
User-Agent:	Mozilla/5.0 (Macintosh; Intel Mac OS X 10_9_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/38.0.2125.101 Safari/537.36
Transaction ID:	0x1a4300e9
Request Method:	GET
Blocking reason:	BLOCK-MALWARE
Web Reputation Score:	-9.5
Malware threat name:	
Malware category name:	
Web reputation threat reason:	Researchers or users identified possible threats.
Web reputation threat type:	othermalware
Proxy hostname:	rtp5-dmz-wsa-1-mgmt.cisco.com

As a matter of good practice, you may check whether your browser or any component plugin is vulnerable by visiting browsercheck.qualys.com. The UID at the end of the browsercheck.qualys.com URL does not uniquely identify your machine to Qualys; it is a shared UID to group all requests originating from Cisco IP ranges.



Identify Source

Identify Malware



Associated Websites

Intrusion Detection and Prevention

Signature Detection – Looking for known attack patterns
Threat Detection – Looking for malicious behavior
Anomaly Detection – Looking for unknown or unusual behavior

Intrusion Detection System = Passive (can't block attacks) and can be inline or off mirror port

Intrusion Prevention System = Can block attacks and must be deployed inline

Can be host (software) or network (appliance / virtual)

Why Tuning Matters

Pearson

How Effective Is Your Prevention Technology?

Stop threats at the edge

Systems + Applications

Websites Accessed

Integrating Security with Vulnerability Scanning

Prevent

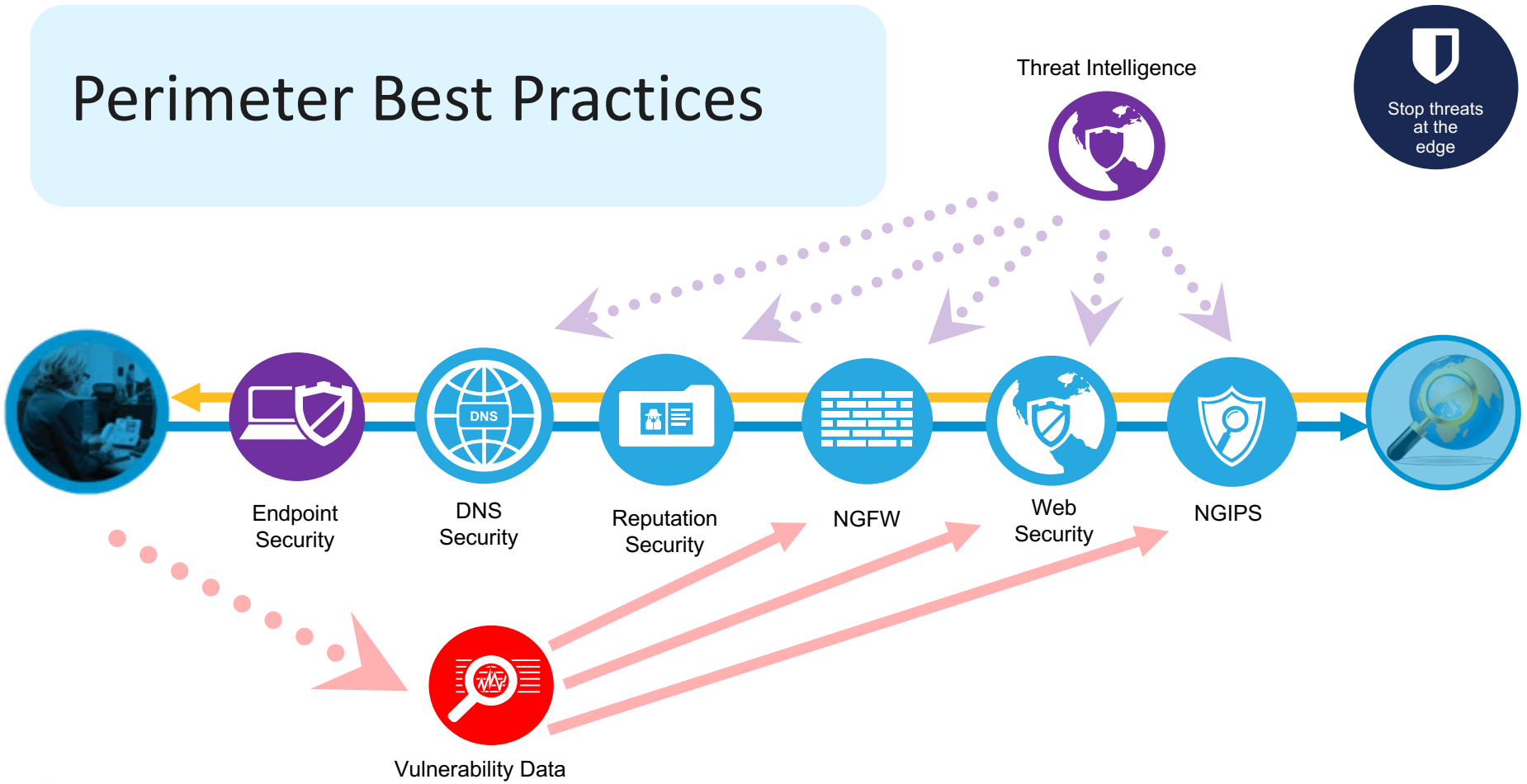
understand

network!!!!!!!!!!

Defending the Perimeter - Better

- Everything starts with DNS
- Application Layer Firewall or Proxy for all layer protection
- Reputation analytics reduces attacks
- IPS for blocking attacks
- Continuously evaluation for vulnerabilities and updating signatures

Perimeter Best Practices



Host Defense

Protecting Endpoints

- **Hardened Configuration** – Disable unnecessary services
- **Patch Management** – Close vulnerabilities
- **Group Policy (GP)** – Pushing security policy to many endpoints
- **Endpoint Security Software** – Antivirus, host IPS, etc.
- **Password Policies**
- **Host Firewalls**
- **File Integrity Checking –** Notifies changes in files

Permissions

Least Privilege – Only rights needed to do job

File Permissions – What people can or can't access
Example: Chmod 777 –Rv = anybody can do anything

Centralized Account Monitoring – Why is Joey logging in from China and Canada within minutes?

Antivirus

File Base Signatures – Known malicious files
File Behavior – Some file analytics
File Modification Detection – Limited encoding detection

Typically older threats – Trojans, viruses, and worms

Targets KNOWN threats with Signatures

Antimalware

- Protects against infections caused by malware, viruses, worms, Trojan horses, rootkits, spyware, keyloggers, ransomware, and adware
- Typically more complete than antivirus (newer threats)
- May be called **File integrity** solution or **breach detection**

Virus – Code capable of copying itself and damages computer

Malware – Umbrella term for various malicious software

Host IPS

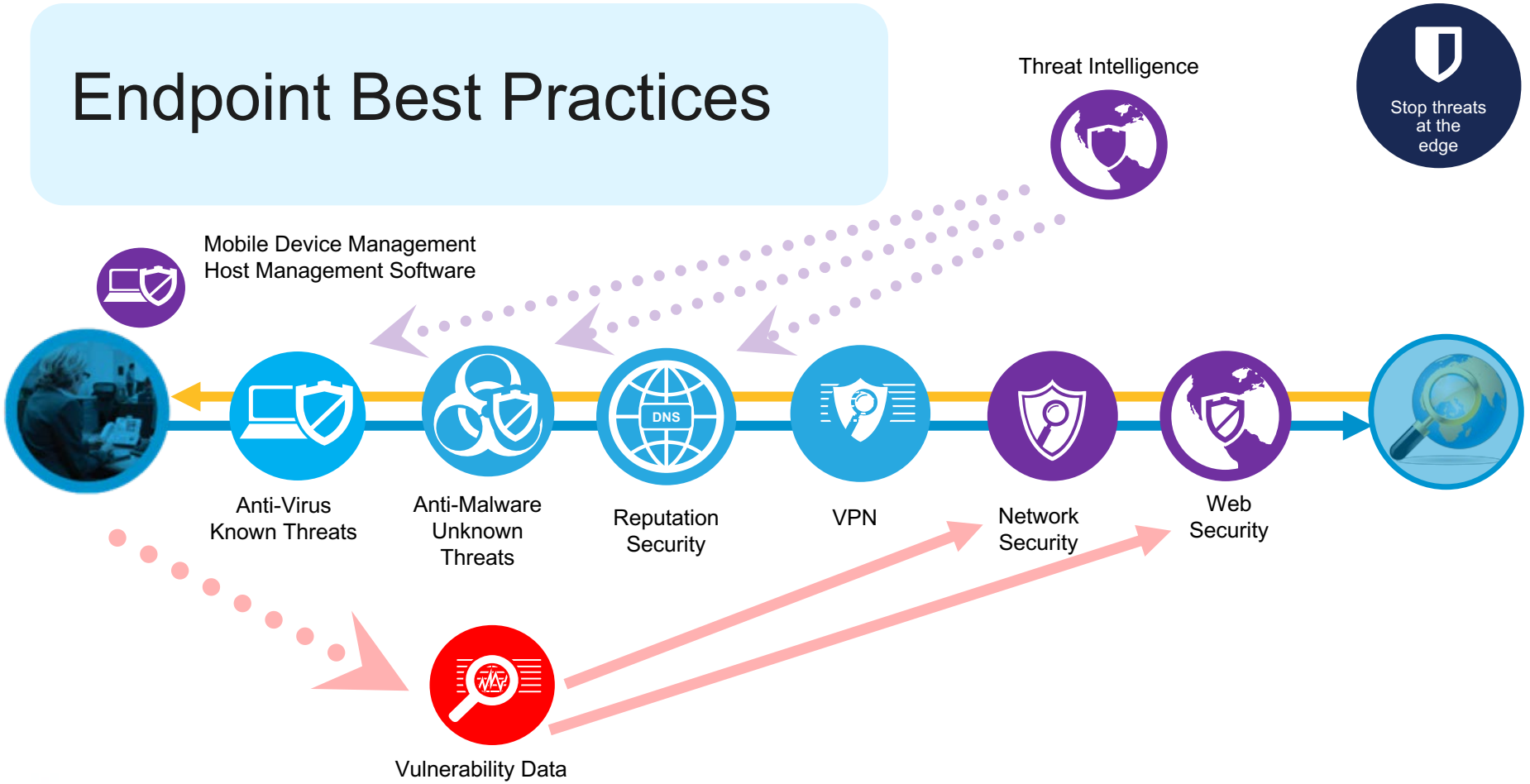
Signature Detection – Looking for known attack patterns
Threat Detection – Looking for malicious behavior
Anomaly Detection – Looking for unknown or unusual behavior

- **Typically deployed with Anti-Virus and other bundles**
- **Best Practices – Share threat data with network IPS**

Exam: Make sure question isn't Anti-Virus before selecting Host IPS

McAfee – Sophos – Symantec – ClamAV – etc.

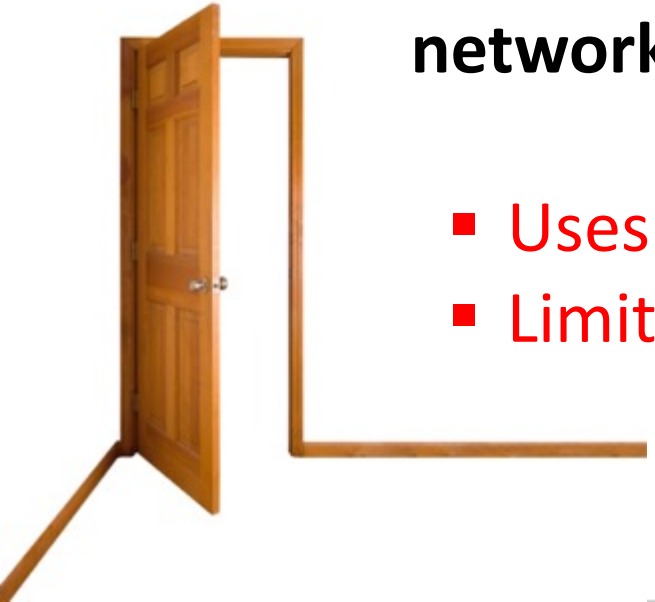
Endpoint Best Practices



Network Access Control

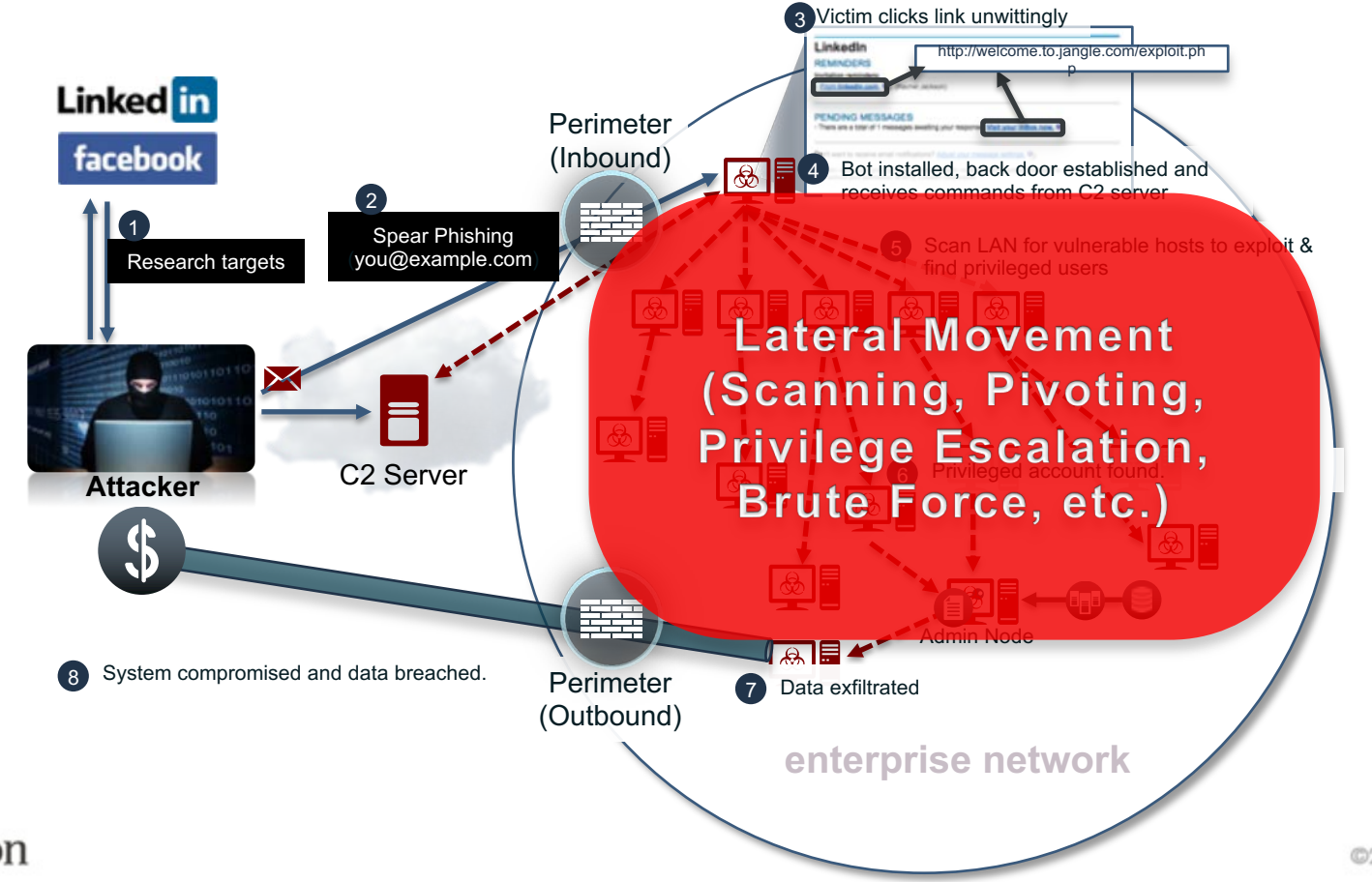
Access Control

- **Basic concept** – Evaluate systems that access the network
- Typically not focused on systems **on the network**

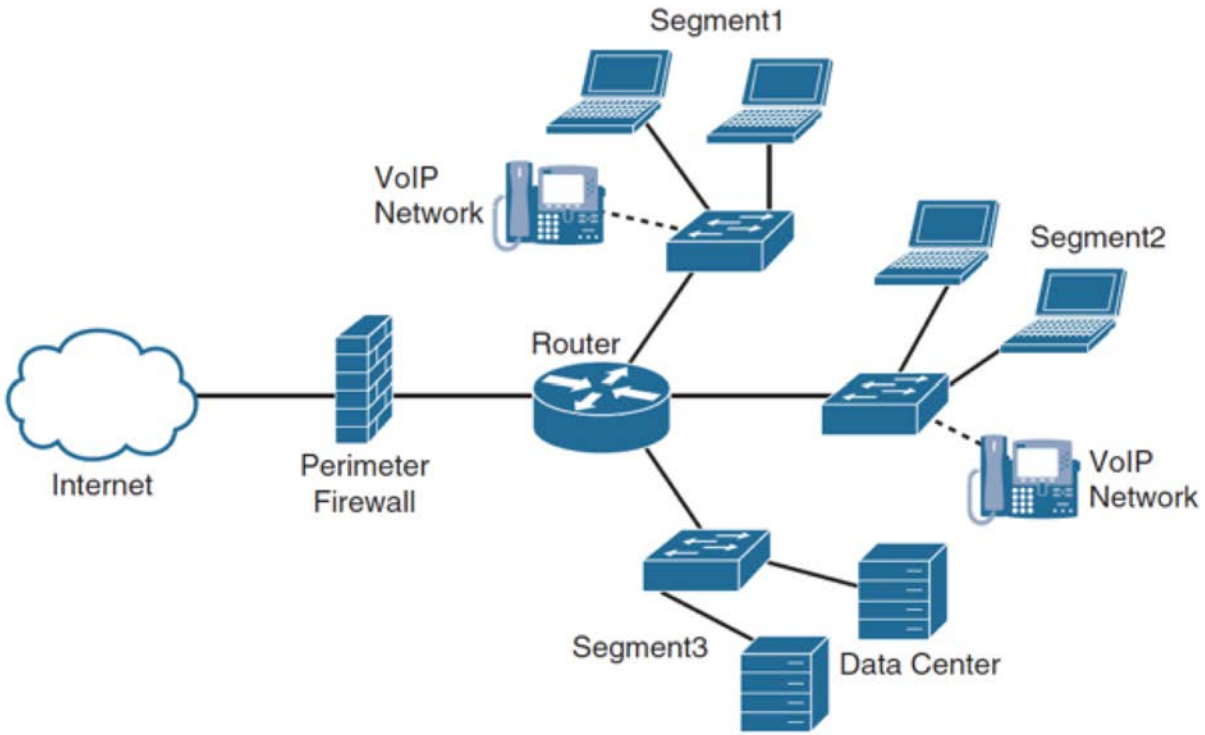


  - Uses other technology (IPS, Breach)
  - Limited inside visibility

Lateral Movement (Without Segmentation)



Segmentation



- Physical Segmentation
- Virtual Segmentation
  - Separate Firewall Contexts
  - Virtual LAN (VLAN) Segmentation
  - Access List Segmentation
  - SGT (Packet Level) Segmentation

Access Control Remediation / Eradication

- **Quarantine** – Limit or deny network access
- **Isolation –** Put into a separate VLAN or take off the network to limit risk
- **Patch / Upgrade –** Windows / AV update
- **Software Link –** Offer software

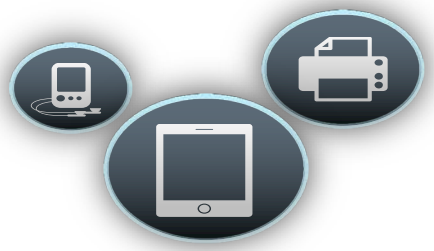
Identity Key Concepts

- Authentication – Who are you?
- Authorization – What can you access?
- Accounting – Record what you do
- Common called AAA

- Multifactor – Using different things to prove identity
- Centralized identity and access management (IAM)
- Directories – Control access level (example LDAP)

Profiling

Control who gets onto your network



Active Scanning

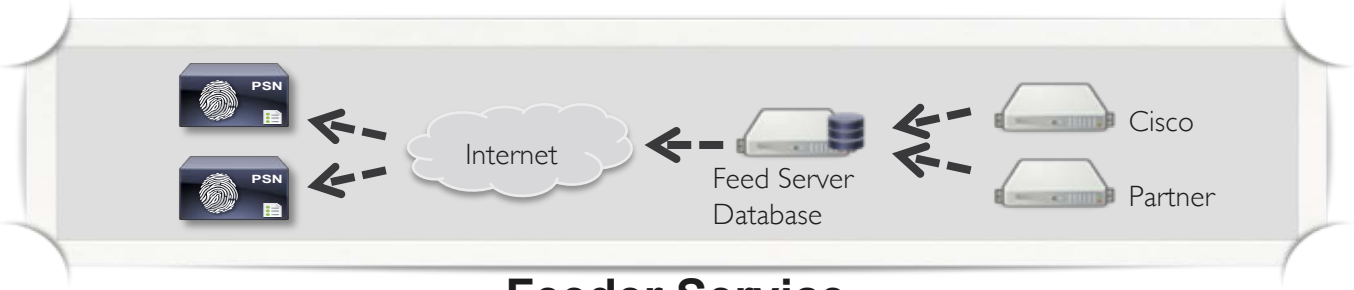
ISE collects device data to determine what it is.

Integrated Scanning

Cisco Wireless Controllers & Switches offer integrated device profiling*

Device Feeder Service

New content dynamically added.



Feeder Service

Posture

Compliant

- Windows Patches Current? ✓
- Part of our Corporate Domain? ✓
- AV Software Installed? ✓
- AV Software Up To Date? ✓

Non-Compliant

- Windows Patches Current? ✓
- Part of our Corporate Domain? ✓
- AV Software Installed? ✓
- AV Software Up To Date? ✗

ISE can isolate non-compliant host and attempt automatic remediation of issues.

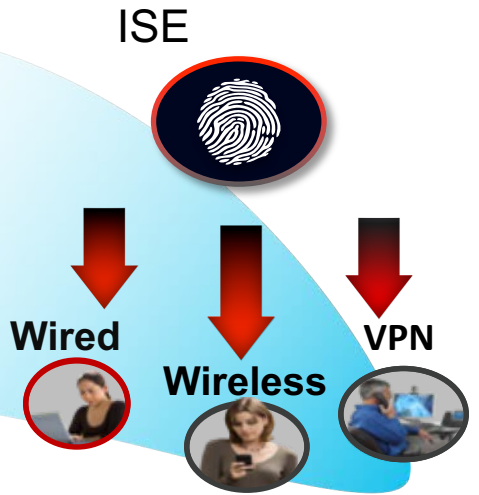
Microsoft McAfee AVG ca TREND MICRO ClamAV SOPHOS KASPERSKY pctools symantec AhnLab

Dynamically Updated Posture Content

Network Access Control Best Practices

Control who gets onto your network

- Who are you? → Raylin
- What Device? → BYOD or Corporate Endpoint
- Where are you? → Building 200, 1st Floor Lobby
- When? → 11:00 AM CST on April 10th
- How ? → Wired, Wireless, or VPN



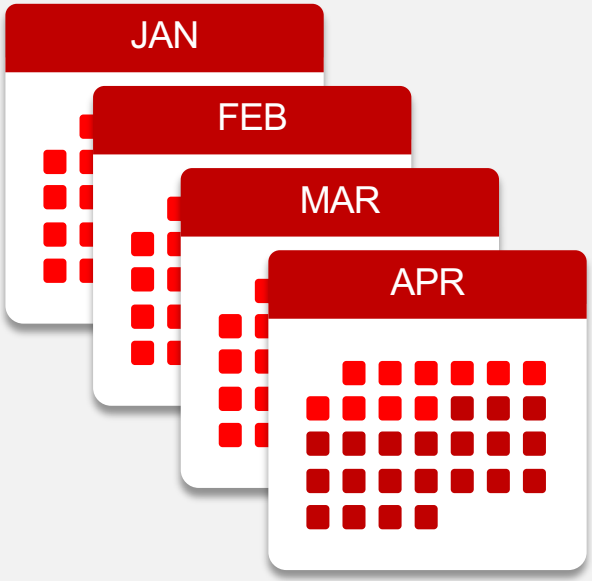
Pearson

Breach Detection

Detect infections earlier and act faster

Find and contain problems fast

Industry TTD rate:* 100 days



Cisco: 17.5 hours

- Automated attack correlation
- Indications of compromise
- Local or cloud sandboxing
- Malware infection tracking
- Malware analysis

Common Historical Data

PCAP – Logging network data

- Example: Listening to phone calls
- More storage / More details

NetFlow – Logging network records

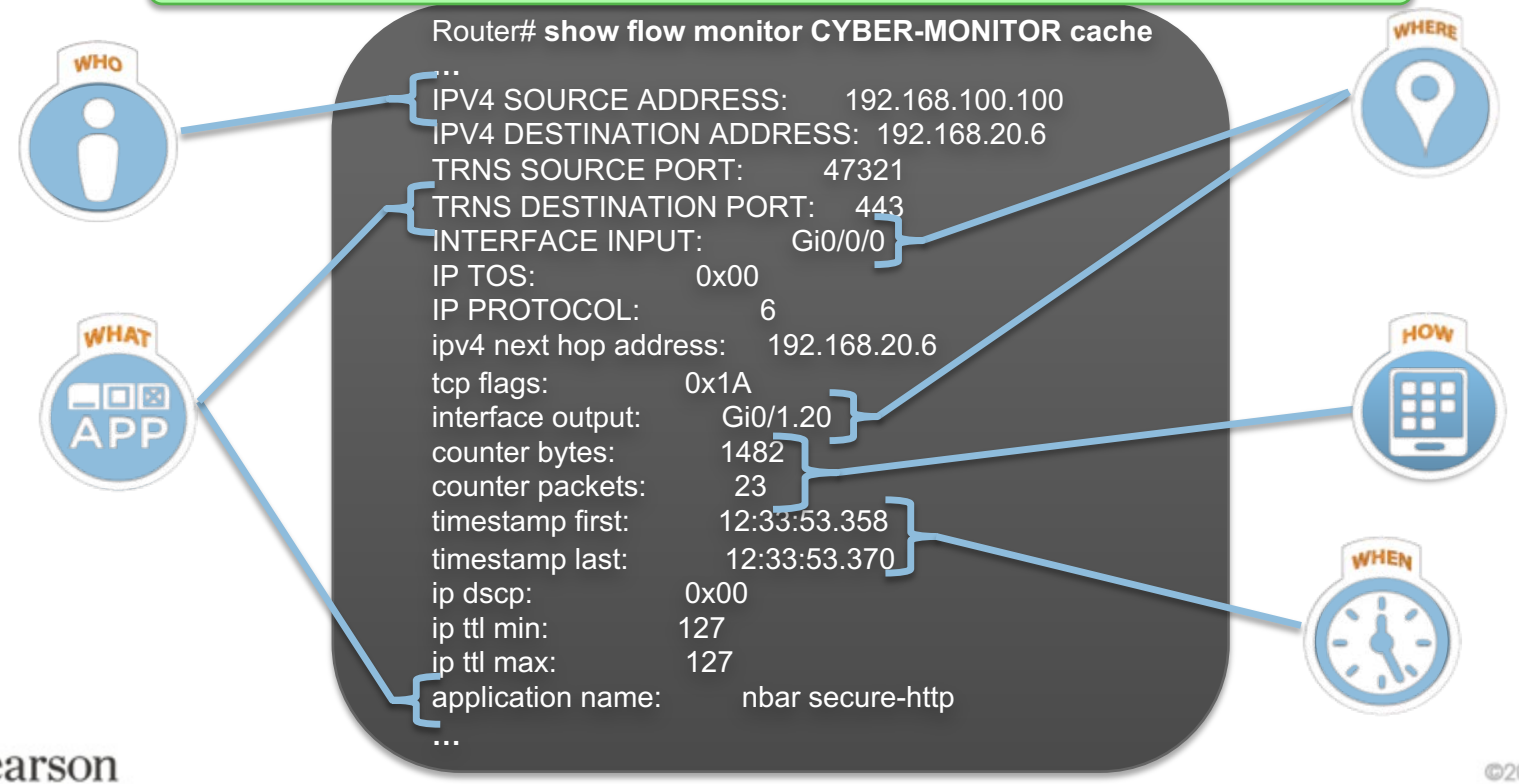
- Example: Looking at details of phone call
- Less storage / Less details

Network Security Technology

- **Firewall** – North South / East West
- **Content Filters / Application Layer Firewalls** – User / Application Data
- **Access Control** – Who and what is accessing network
- **IPS/IDS** – Signature and some behavior detection
- **Honey Pot** – Monitor traps
- **NetFlow** – Leverage network traffic for indications of compromise
- **Network Baselines** – Tools used to verify normal and unknown traffic

NetFlow = Visibility

A single NetFlow Record provides a wealth of information



Why Unsampled NetFlow?

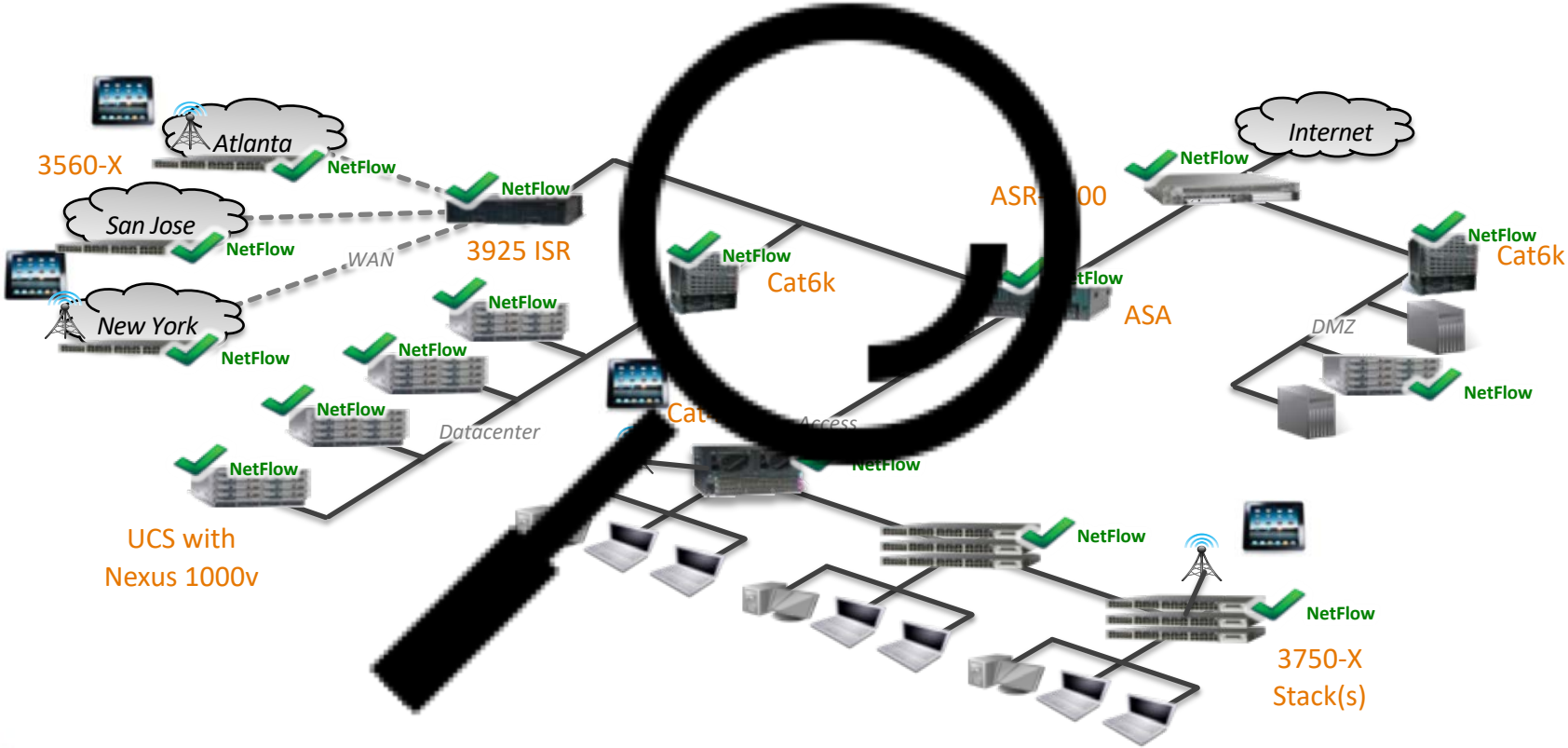
Sampled NetFlow

- Subset of traffic, usually less than 5%,
- Gives a snapshot view into network activity
- Similar to reading every 20th word of a book
- Suitable for detecting large scale DDoS attacks, but not extended, slow attacks

Full NetFlow

- All traffic is collected
- Provides complete view of all network activity
- Similar to reading every word, page of a book
- Suitable for detecting large scale as well as extended, slow attacks

Turn the Network into a Security Sensor Grid



Packet Capturing

Port Mirroring – Use network switches to mirror traffic seen on ports or VLANs.

Network Taps - Monitor and capture packets from point-to-point links. Network taps capture and copy network packets without involving the active network components, making them suitable for most environments.

Compliance – Forensics - Troubleshooting

NetFlow vs Packet Capturing

at&t

Page: 259 of 849
Billing Cycle Date: 09/12/11 - 10/11/11
Account Number: 828074228
Foundation Account Number: 000764169

Data Detail (Continued) 479-387-2554

User Name: UNIVERSITY OF ARKANSAS FAYETTEVILLE

Rate Code: MSGU=Messaging Unlimited, IPGB=4GB Data_Tethering
Rate Period (PD): AT=Anytime
Feature: SMH=IMB SMS $0.00, MMH=IMB MMS $0.00, MBRA=GPRS MB Dom $10.00/1GB APN002:APN003:APN004

Item	Day	Date	Time	To/From	Type	Msg/KB/Min	Rate Code	Rate Pd	Feature	In/Out	Total Charge
54		09/12	3:56PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
55		09/12	3:56PM	479-236-9780	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
56		09/12	4:01PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
57		09/12	4:09PM	479-236-9780	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
58		09/12	4:11PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	Out	0.00
59		09/12	4:12PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
60		09/12	4:21PM	479-236-9780	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
61		09/12	4:28PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	Out	0.00
62		09/12	4:29PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
63		09/12	4:29PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	Out	0.00
64		09/12	4:30PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
65		09/12	4:32PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	Out	0.00
66		09/12	4:32PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
67		09/12	4:45PM	479-236-9780	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
68		09/12	4:51PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	Out	0.00
69		09/12	4:56PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
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71		09/12	4:58PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	Out	0.00
72		09/12	4:59PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
73		09/12	4:59PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
74		09/12	5:01PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	Out	0.00
75		09/12	5:01PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00
76		09/12	5:03PM	479-856-9535	MTM TEXT MESSAG	1 Msg	MSGU	AT	SMH	In	0.00

Pearson

Routing Sinkholes

- Admins setup internal routing sinkholes to route unwanted traffic
- Many times, routing is sent to a null interface
- This is less processor intensive than blocking traffic

Same as botnet sinkhole but send other types of threats

Sandbox: Execute untrusted programs or code

Honey pot: vulnerable system designed to be a decoy and attract attackers

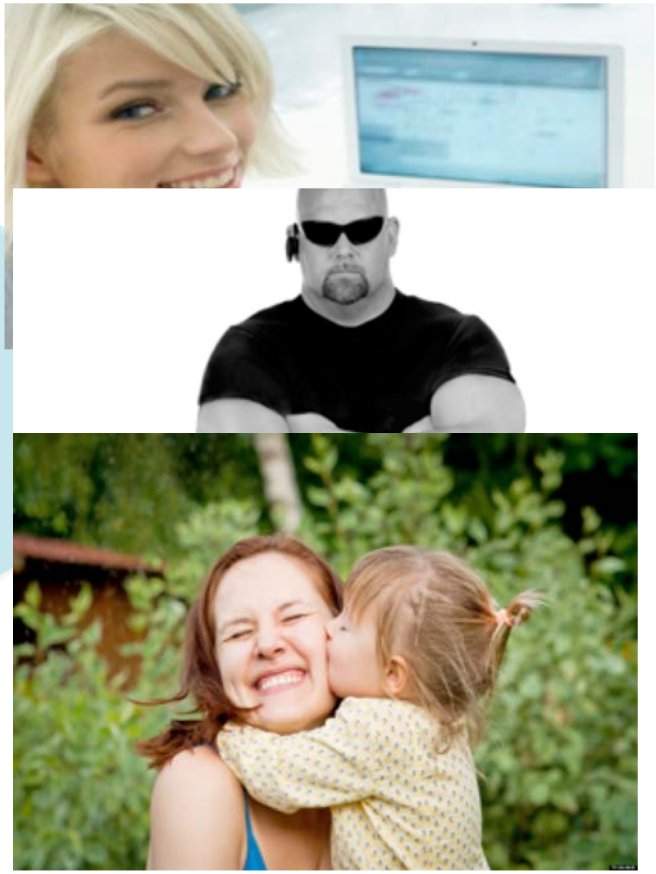
*Make sure these don’t become a gateway for attackers!

Sandbox

- Environment to simulate host system
- Virtualized platform that runs various operating systems
- As malware explodes, it records behavior
- New sandboxes will run standard images from an organization
- Malware tries to detect and evade sandboxed environments

Pre NAC

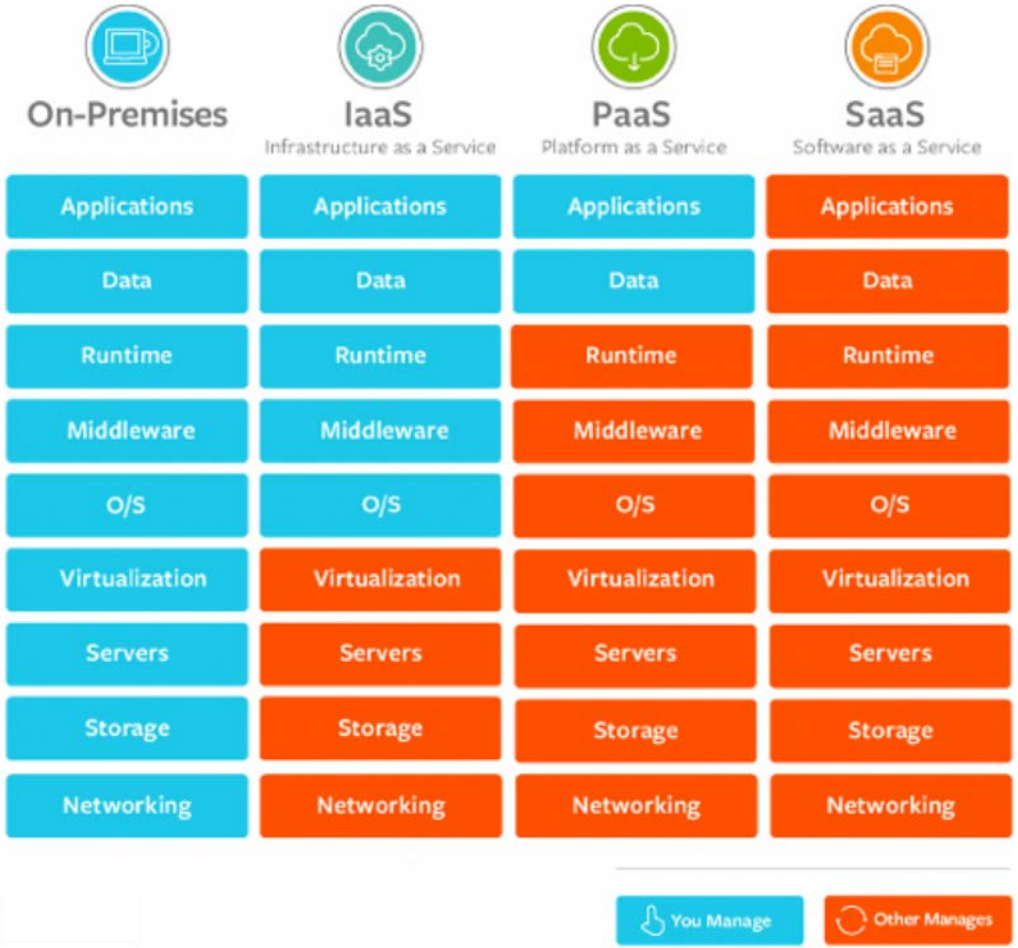
Post NAC



Cloud Security

Cloud Services

- SaaS – Everything in cloud via cloud service provider (CSP) responsibility (ex. DropBox
- PaaS – Run your applications within CSP
- IaaS – Run your servers within CSP (ex. Azure, Amazon Cloud)

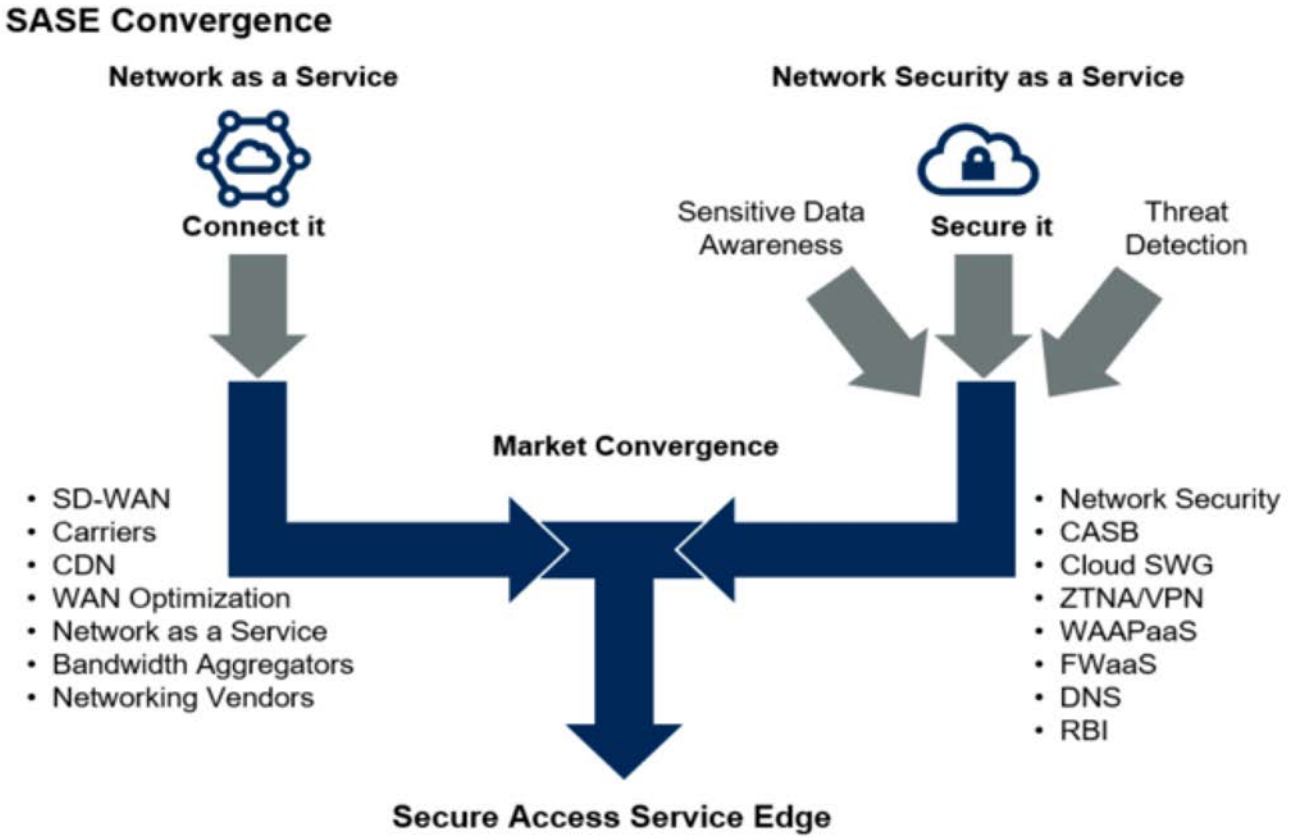


SASE Interest Starts with Gartner Claims

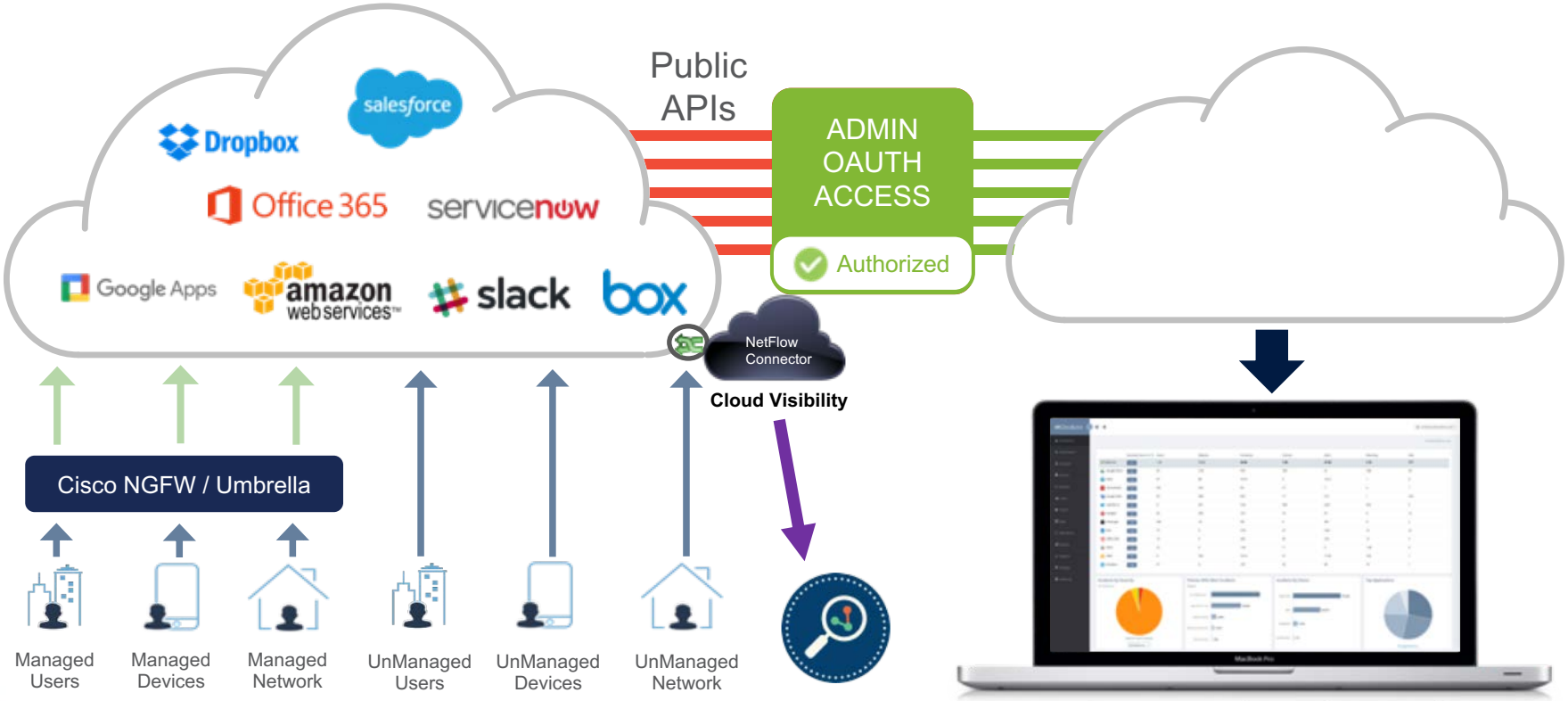
*"SASE will be as **disruptive** to network and network security architectures as was architecture for datacenter design"*

*It's a technology that Gartner has called "**Transformational**"*

Combines **Security functions** with **WAN capabilities (SD-WAN)** to address changing enterprise traffic patterns and threats



CASB - API Access (Cloud to Cloud)



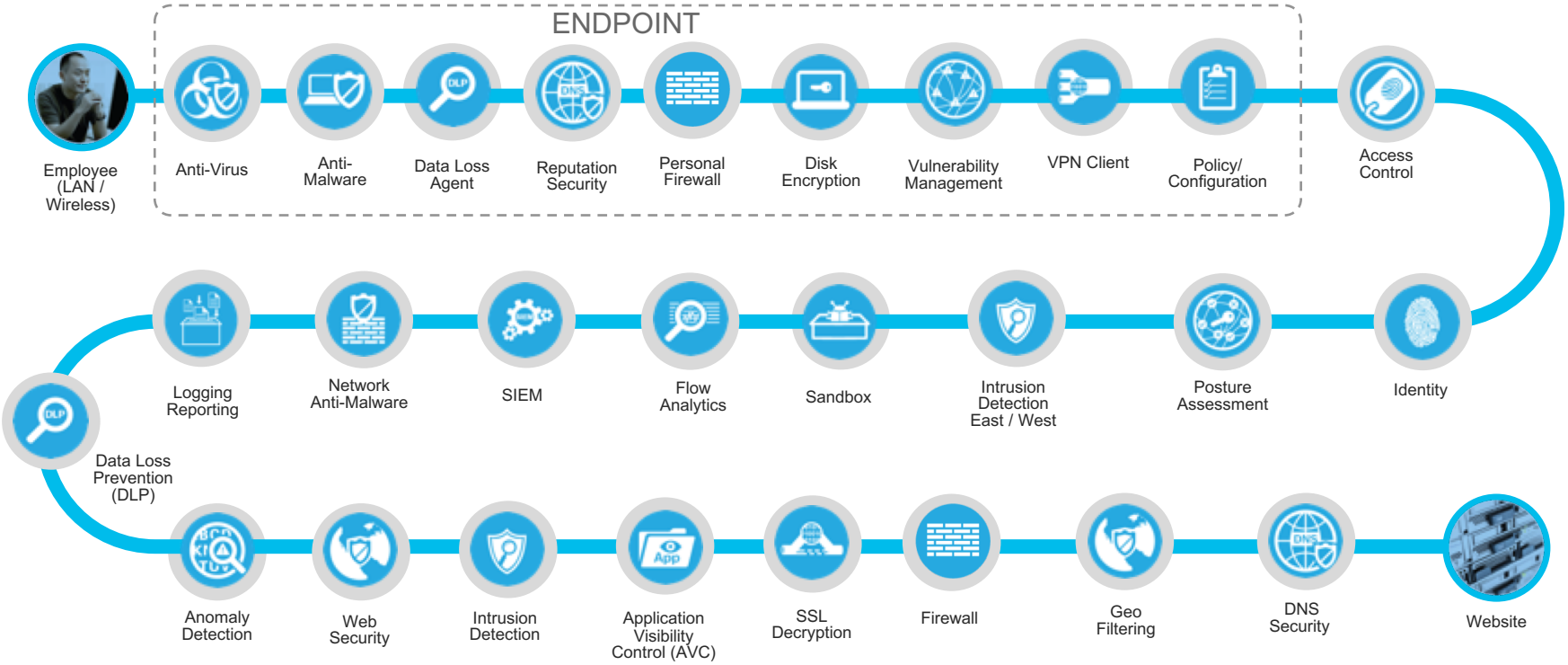
Pearson

Architecture Best Practices

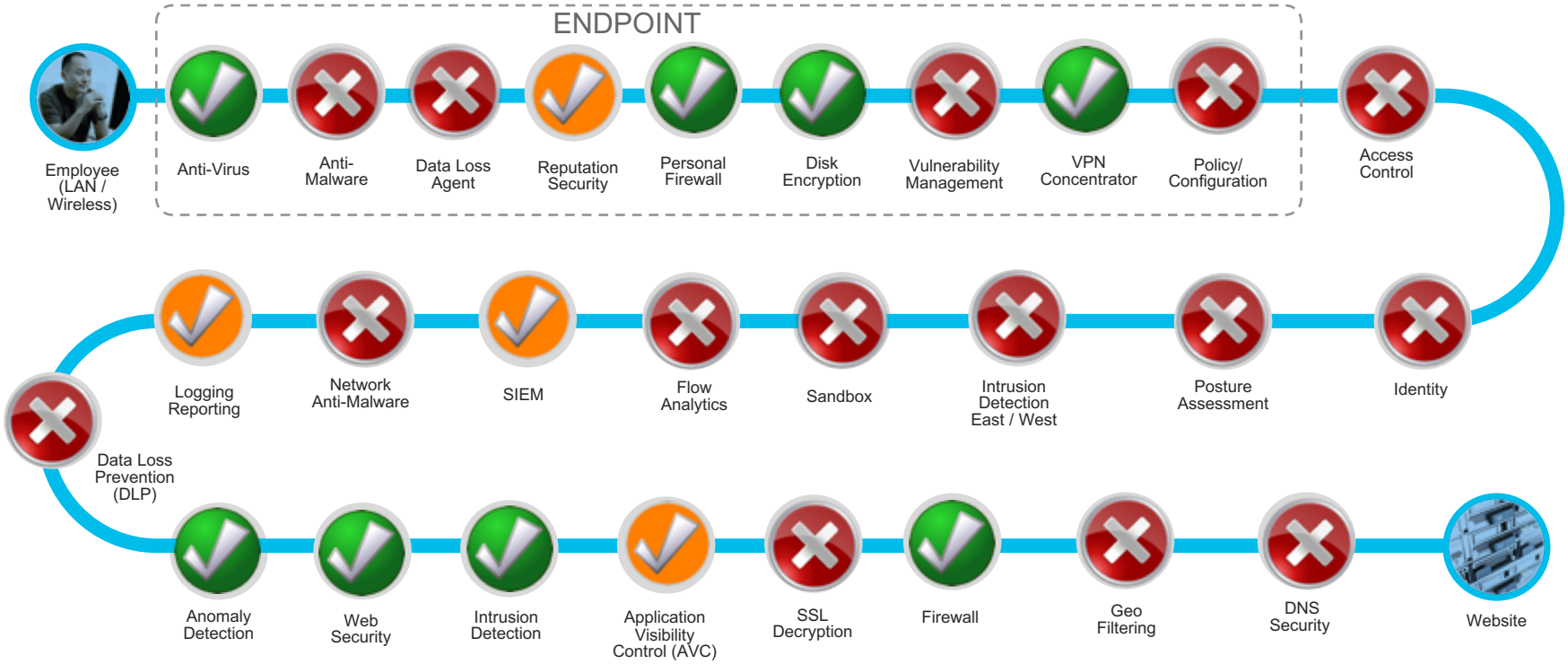
Common Architecture Challenges

- **Single Point of Failure -** High availability / redundant systems
- **User and policy challenges**
- **Authentication and Authorization -** Multifactor authentication and account management can help
- **Data validation / Trust –** Enforcing CIA
- **Budget for improvement**
- **Install and maintenance**
- **New Complexity**
- **Lack of understanding the technology and value**

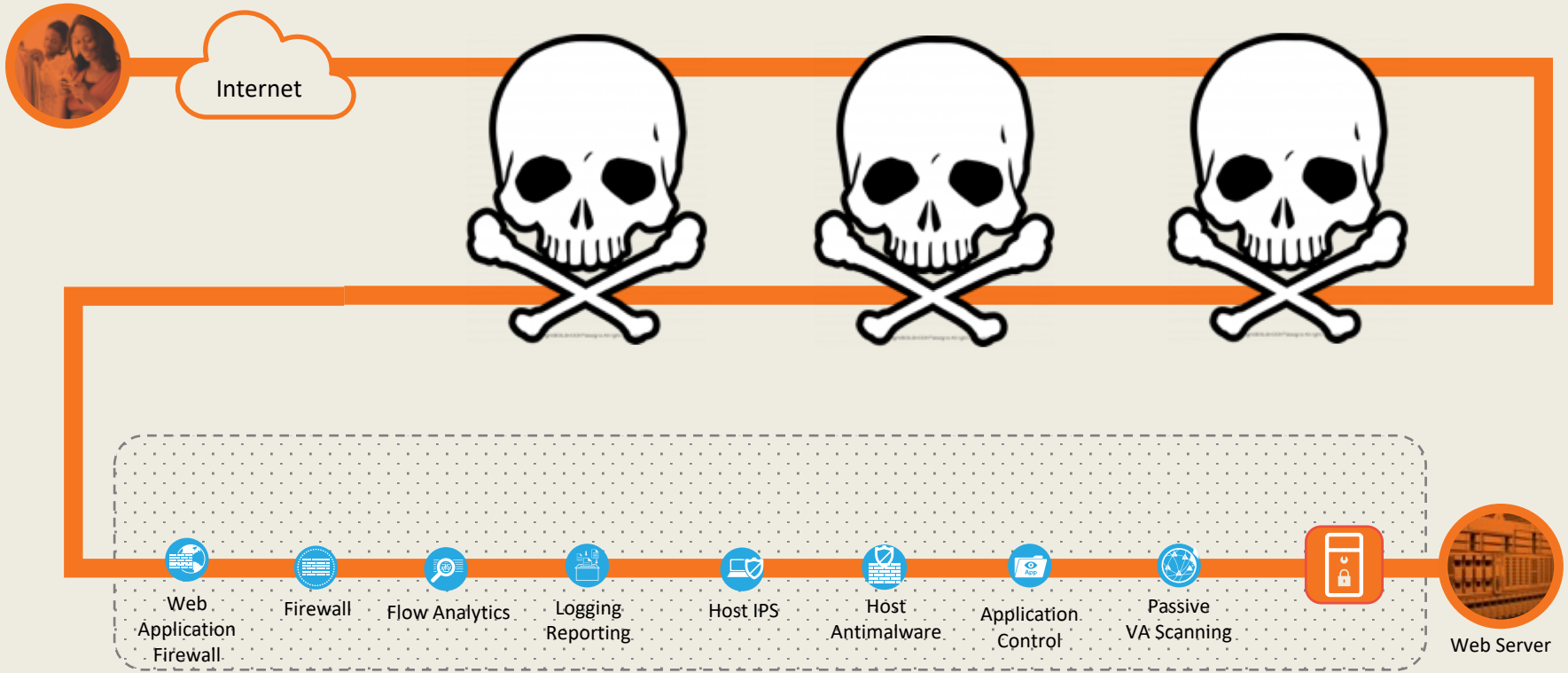
Employee on site to Internet



Employee on site to Internet

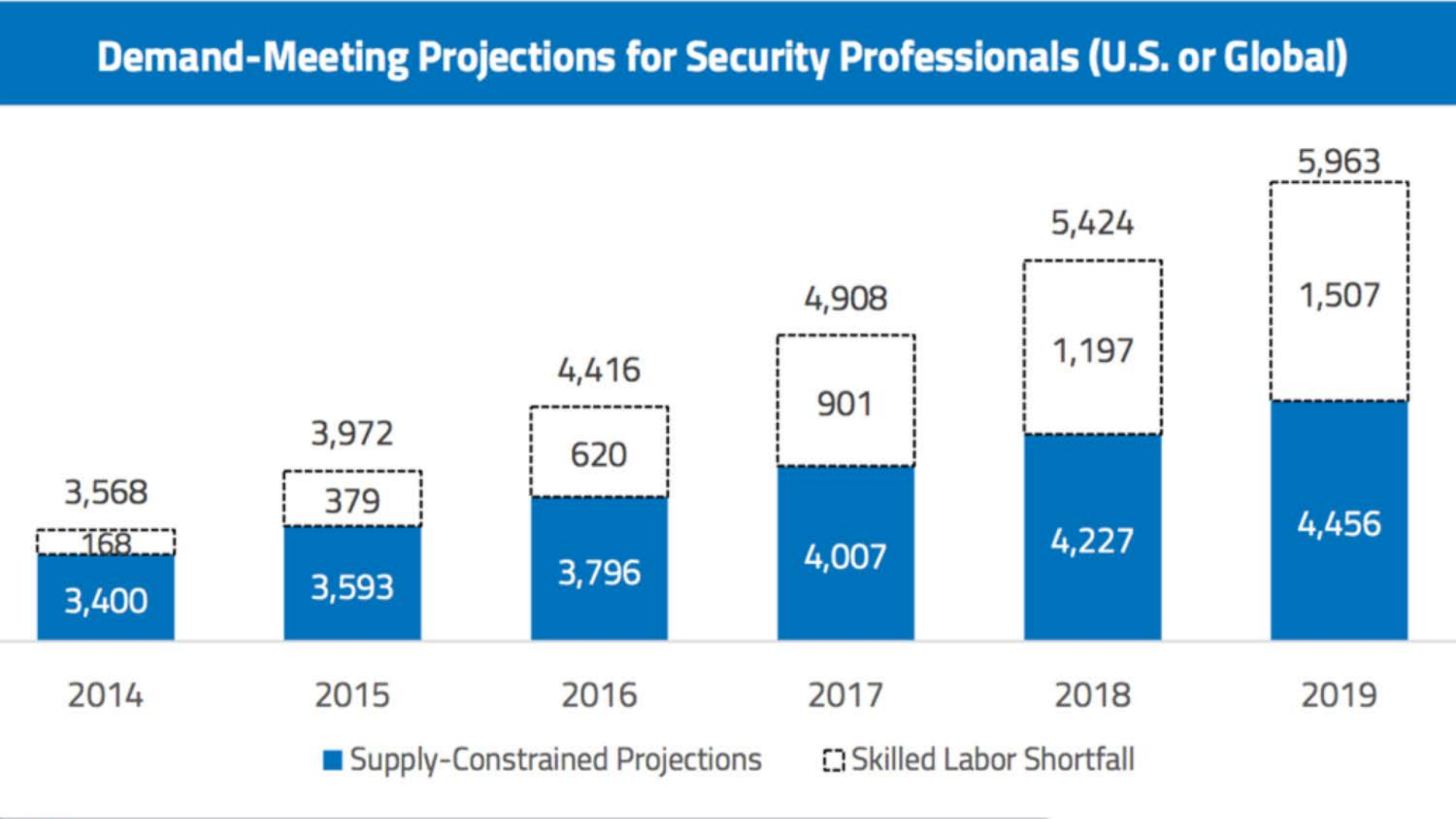


Focusing on Datacenter



Certification and Training

Demand-Meeting Projections for Security Professionals (U.S. or Global)



Which Job For Your?

- **Manage Products** – Network or Security Engineer
- **Install Hardware** – Services
- **Operations** – Analyst
- **Break into things** - Pen Testing
- **Compliance** – Auditor
- **Sales** – Presales Engineer / Architect

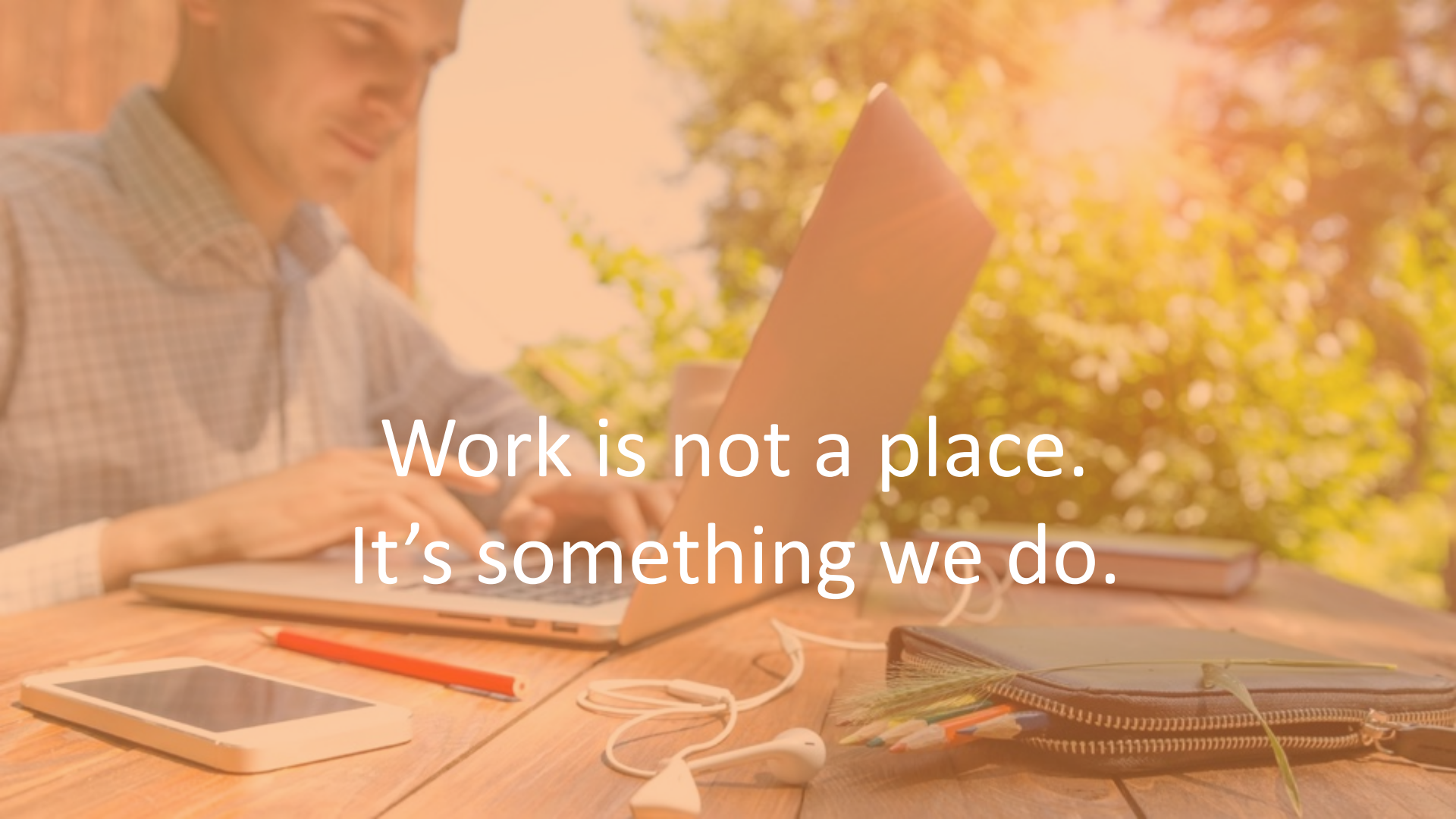
Specialize makes more $$ than generalist

Certifications

- CISSP – Basic Technology and Language Test
- CEH – Introduction to Pen Testing
- CHFI – Introduction to Forensics
- SANs – Many skilled exams
- OSCP (Kali) – Challenging Kali Linux Training

Lots of Free training too - Youtube


Are You Ready For The Next Threat?


Work is not a place.
It’s something we do.


We will connect everything.


Threats will increase.
Volume and sophistication.

Security is a **Journey** … not a **Destination**!